The Journal

OF THE

Royal United Service Institution.

VOL. XIII. 1869. No. LIV.

LECTURE.

Friday, March 12th, 1869.

GENERAL SIR WILLIAM J. CODRINGTON, G.C.B., in the Chair.

THE ESTABLISHMENT OF COUNTY MILITARY TRAINING SCHOOLS; A SUGGESTION FOR IMPROVING THE RECRUITING SYSTEM.

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IN this land of free opinion and debate, every State department is exposed to the criticism of any one who happens to magnify his interest in some political, ecclesiastical, military, or naval hobby into proof positive that he is specially entrusted with a reforming mission. This must appear to departmental eyes, and doubtless very often is, sheer presumption. But it is not State departments alone that are subjected to the criticism and dictation of amateurs. Art, science, literature, &c., are considered fair game for the critical shafts of churchmen, soldiers, sailors, and politicians. Aye! and in nine cases out of ten, the amateur critic will have the public with him, because his knowledge of the subject is nearer on a par with the ideas of the mass. The din from this *mêlée* of specially gifted critics keeps us all awake in our own proper professions, and though it may sometimes disturb and "rile," it often makes us laugh. There are several circumstances to tempt and favour the venturesome outside critic; the maxim, *surtout point de zèle*, though mysteriously but plainly posted up before official eyes, has neither terror nor deterring influence for him, and even if that spectral maxim were not a sufficient check upon the ardent official would-be-reformer, there is the weight of precedent, routine, and detail to overwhelm and smother suggestion at its birth. The foregoing remarks at least form the best plea I can

offer for my temerity in addressing you upon a subject like the present—a subject with which it may possibly, and justly be said, I have no business. A too sanguine temperament may have invested the scheme I am about to submit to you, with an artificial glow of importance in my own mind; but there is this also to be said, that in mental aiming, as in rifle practice, the inexperienced sometimes hit the mark by a "fluke." It is just possible, therefore, I may not detain you in vain. I wish moreover to show you that painters are not, as recently asserted by a leading review, notoriously indifferent to public affairs.

It appears to me, that our first question with reference to any special branch of education in England, indeed of any special department, should be—Are our existing means the best that can possibly be devised for the special purpose? If not, it is our immediate duty to put aside any prejudice in favour of an existing order of things, and determine that they shall be.* To this end I do not think it safe at all times to follow those "reformers" who eternally exhort us to follow continental example; every nation has certain idiosyncracies, and all true reforms should in some measure be founded upon, and conformed to national characteristics.

The neighbours of a professedly military nation, maintaining an enormous standing Army, have but an alternative either to establish an equal and similar armament, or to make their whole populations partially military by a limited period of service; by the institution of the Landwehr, as in Prussia, or by the Militia and Volunteer systems, as in England. The Germans and Anglo-Saxons more peacefully and commercially inclined than some other races, are averse to being taxed to support vast standing armies; they only consent to do so under pressure, for defence, never willingly for defiance. For the more excitable and bellicose nations, the colossal standing-Army-system is perhaps a political necessity; for were these to attempt the adoption of the Prussian or English systems, it would only lead to internecine war. An excitable and combative people will fight either abroad or at home, unless perfectly under the control of a central power. The Landwehr is felt to be a great inconvenience and burden to the commercial classes in Prussia, but what would such an institution be to our own high-pressure trading community? The conscription, even, is not borne with a very good grace by a military people. We prefer, therefore, to maintain a moderate standing Army, and to trust in cases of emergency to the patriotism of our countrymen, to our Militia and Volunteers. Nevertheless, the English system has its inconveniences too, and we

* It was with this conviction that when, in 1851, the application of the surplus funds of the first Great Exhibition was under the consideration of the Royal Commissioners, I published a pamphlet, suggesting the establishment of a Great Central Polytechnic College at South Kensington, or some other convenient site, wherein every faculty of art, science, and literature should be represented by the best professional expositor to be obtained, either at home or abroad. This pamphlet contained lithographed plans of the theoretical arrangement of those Faculties in the proposed Central College, and of Primary Schools. Copies of it were forwarded to the noblemen and gentlemen composing that Commission. The military training schools are a portion of the entire scheme of education then conceived.—W.C.T.

have on more than one occasion, found it difficult to expand and recruit the Army and Navy to meet an urgent call. My purpose in this lecture is to submit a plan to your notice, which I have thought, and I hope you will consider in some measure calculated to remedy these defects, to give more stability to our whole military system, and more organically to unite the Army, Militia, and Volunteers, at the same time indicating the means by which a certain measure of that promotion from the ranks, which is popularly looked forward to as a necessary condition of an ideal Army, may be gradually introduced without materially affecting vested interests. I say "*gradually* introduced," for we fortunately know in this country that any great change in either military, or other State affairs, is better thus than suddenly effected; and when the interval between the present and the future is bridged over by tentative measures and compromises. Nevertheless, this question cannot be lightly dismissed nor altogether "shirked," for the absence of any very obvious and recognizable element of promotion from the ranks will be fraught with more and more danger. The reason may not be obvious at first sight, but if we can possibly conceive a revolutionary spirit springing up in this country, the closed avenues to promotion would be the key to a successful attack upon the constituted order of things, to effect the disorganization of the State; for a party strong enough to agitate the question of promotion from the ranks, and to promise open competition, a fair field and no favour to soldier and sailor, would be able to spread disaffection in both services. We shall presently see other reasons why such an agitation might, under certain circumstances, be productive of dire results.

We must recollect that our Armies have hitherto been chiefly composed of the crude uneducated soldier, having no aspirations beyond his immediate duties, and perfectly subjected by drill and discipline. But this staple of the old style of British force is gradually disappearing; it is daily becoming less and less possible, even were it expedient, to have again an Army composed of such human material. The staple "private" of former English Armies will be gradually displaced and supplanted by a man of a very different stamp, more educated, more thinking, more reasoning, who will require an altogether different mode of treatment, which, if foreseen and thoroughly understood, will secure a greater military efficiency, and enable our Armies to achieve even more astonishing results than heretofore. In a country where the masses are rapidly becoming informed, as well as supplied with increased material comforts, the unquestioning implicit obedience of the aboriginal soldier will have to be exacted by other means than by sheer despotic coercion; the new staple of our Armies will rate itself at a higher price, and recruiting will become more and more difficult, unless some greater and more tempting inducements than were formerly, can be proffered. The young men in humble life, who now lead more genial lives, are gradually being educated, and are becoming shrewd enough to inquire "why they should endure hardship and servitude for the inadequate rewards the recruiting sergeant, with all his glamour of colouring, can offer." These very men, however, would freely yield

service and obedience if some of the drawbacks of barrack life could be mitigated, and the higher prizes of promotion were to be open to a more general competition.

That the gradual change in the human material of our Armies is no mere rash speculation, no mere phantom of my brain, may be gathered from the following tables, derived from the fourth report of the Royal Commission on Army Schools.

Table No. 1 shows the state of education in the Army in 1868, and was deduced from returns, received from the Adjutant-General, of regiments and corps amounting to 169,214 men. The per centage in the last column is taken from the Council's Report of 1865.

This return does not include fourteen battalions of infantry from which no returns had then been received.

TABLE I.

	Number returned.	Per centage in 1868.	Per centage in 1866.	Per centage in 1865.
Class 1.—Who can neither read nor write	16,010	9·46	12·25	12·97
Class 2.—Who can read but not write	17,924	10·59	16·12	16·55
Class 3.—Who can read and write	124,893	73·80	65·47	63·67
Class 4.—Who have a superior education	10,387	6·14	6·16	6·80

Table No. 2 shows the proportion of "uneducated" among the several branches of the service, comprising under that term classes 1 and 2 of the above table (viz., those who can neither read nor write, or who can read but not write). The per centages in the last two columns are taken from the Council's third report.

TABLE II.

Corps.	Classes 1 and 2, Uneducated.			
	1868.	1866.	1865.	1860.
Cavalry	10·90	19·13	19·78	22·03
Royal Artillery	18·30	20·42	19·41	25·65
Royal Engineers	1·34	3·17	3·34	5·36
Military Train	24·37	24·30	38·62	42·37
Foot Guards	8·12	8·66	10·06	10·96
Infantry of the Line	25·54	33·99	35·71	45·62

In Table No. 1 we observe a gradual diminution of the "uneducated" element, but in Table No. 2 the progress from 1860 to 1868 is very

marked. Now I think this educational improvement is not to be wholly attributed to the influence of the Army Schools, if we may judge from the following passages derived from the reports:—

Mr. Vicars, reporting from Ireland, "regrets that the average daily "attendance continues to bear an unfair and unsatisfactory proportion "to the number on the school books. On looking back to the return "of 1862 he found that the attendance was equal to something like "40½ per cent. of the number on the register, whilst in 1865 it was "only 30½ per cent. Mr. Sargeant finds no improvement during the "past year (1865). He refers to a depôt battalion in which, after "deducting the attendance of the buglers, there remained 5,808 atten- "dances to be divided between 384 men, giving an average of 15 "attendances per man during one half year. 167 of these men put in "from 1 to 5 attendances, only 25 of the 384 made attendances in "each of the six months, 'that is to say, all except 25 men were "absent during the whole month.' Colonel Maude reports from "Gibraltar that the general attendance of the adults, those of the "special classes excepted, has been irregular, the average attendance "of each adult being made two or three times a month. Special "reasons are adduced to account in some measure for irregularity of "attendance during the past year, but after making all due allowance, "the facts are not encouraging."

And again, "Colonel Romer at Malta is unable to make a satis- "factory report on the attendance of the men." The great increase in the *educated* element during 1865, 1866, and 1868, is therefore more probably due to the advancing education of the masses. But whether the Army becomes an educated Army from internal or external causes, it will at the same time that it becomes a more effective one under proper treatment, become also a more thoughtful and reasoning one. These anticipations, therefore, justify the immediate suggestion and consideration of measures to meet the new state of things.

I am now, as when I first took an active part in the Volunteer movement, forcibly impressed with the conviction that the military training of a people, judiciously conducted and with the perfect understanding that, except upon any emergency occurring, it is to be considered in the light of a beneficial discipline and means of physical training, would prove one of the most effective educational means of raising and ennobling a people that could be devised. Can any one doubt that the great mass of the work of the country, whether of manufacture or agriculture, would be better done if workmen went through a good course of drill in the Militia or Volunteer ranks? But when I speak of workmen serving in the Militia, I propose that there should be a distinct branch of the Militia specially established for that purpose, which should be called the Reserve, and be subject to somewhat similar conditions with regard to pay and drill as the Militia, but that this branch of the forces should be immediately under the government of the War Department. This, too, is a measure which might be used to effect a gradual change in the entire Militia, if it were considered expedient to bring it by degrees under the immediate control of the central authority. I have considerable knowledge of the working

men of this country, and feel confident that so far from mischief ensuing, considerable strength, as well as industrial advantage, would be gained by the commonwealth if they could be induced to join the proposed Reserve for a limited period of service. You will readily understand why, regarding as I do a certain amount of military training as an educational element, I should desire the Reserve to be a separate Institution fenced about with some degree of exclusiveness.

An old proverb tells us to "beware of playing with edged tools;" we know the value of the warning, and that readiness for, is to increase the probability of war, under certain conditions. But my faith in the temper of the English people leads me to believe that they can play with all the panoply of war without desiring to be hostile, to sharpen their swords, or to load with anything but blank cartridge, except upon great provocation.

I will turn, however, from these general and preparatory remarks to develop a scheme of County Military Training Schools, as a suggestion towards improving the recruiting system, the first sketch of which appeared in a letter addressed to the editor of the "Pall Mall Gazette," March 22, 1867. I use the title *county*, because being a familiarly recognized division of the kingdom, it gives at once a clear notion of the project, though it would doubtless be found more expedient in carrying out the project to equalize provincial disparities of area and population by a judicious division of the whole country into equable military districts. The following then is, with some slight modifications, the outline of the scheme proposed in the letter referred to.

1. That there be a Military Training School established in each county, which shall consist of three departments, the primary, the middle, and high schools.

2. *The Primary School.*—To be open to boys of humble birth, able to read and write, who being desirous of preparing themselves to enter the Army shall have their parents' consent. Term of service from 14 to 23 years of age, viz., from 14 to 17 in the training schools, from 17 to 20 in the Reserve, from 20 to 23 in the Army. This department to afford the means for improving the education of the lads who enter it, and for training them to industrial occupations useful in the Army. Drill would, of course, form a part of the daily routine. Promotions to be periodically made from the Primary to the Middle school.

3. *The Middle School.*—Open to the sons of yeomen and small tradesmen at an equitable annual charge to parents or guardians. The boys to be admitted on recommendation, if able to pass a moderate examination. The number of admissions to be regulated by authority. The lads entering this department to be educated for the Engineer Corps, and for the duties of Non-Commissioned Officers. Age of admission and term of service as in the Primary School. Payments by parents or guardians to cease on the pupils attaining the age of 17, the youths would then join the Reserve, and after passing through their term in that, enter the regular Army. Promotions to be periodically made to the High School. Promotions from either

of the schools should, perhaps, earn an extension of the educational term.

4. *The High School.*—For the sons of the wealthy; admission by competitive examination at 15 years of age. Number of admissions to be regulated by authority. The expenses of education and maintenance to be defrayed by parents or guardians. The education to be specially scientific, and include those subjects which would also be available in competitions for civil appointments. Competitions periodically to take place for commissions. Certificates or diplomas from this department should give preference to the holders in the purchase of commissions, and to candidates for the Reserve, Militia, or Volunteer appointments.

5. That Naval Schools, similarly constituted, be established at all the principal seaports.

6. That the buildings of the Primary, Middle, High Schools, and the head quarters of the Recruiting Staff for the district be in proximity; and that the schools be contiguous to a commodious parade ground. Each establishment of the kind to be located at some conveniently accessible point in the particular Military District.

Such then is the rough sketch of "the suggestions." I will now proceed to take each department seriatim, and endeavour to explain more fully its working and objects.

Further Development of the Scheme.

Primary School.—In my first sketch of the proposal in the "Pall Mall Gazette," it was not suggested that candidates for admission to this school should have to pass an examination, or should be subjected to any educational test; but the following passage from the Report on Army Schools changed my opinion on the subject, and induced me to add the condition, *that a moderate degree of proficiency in reading, writing, and arithmetic should be one of the necessary qualifications for admission.* The passage alluded to, refers to the school of the Royal Chelsea Asylum, and runs thus:—"Formerly no boys were admitted after 10 years of age. After the Crimean War the age was raised to 11 years, and last year it was raised to 12 years. As there is *no qualification required for admission*, many boys enter who are entirely ignorant of the rudiments of education, and *having grown up to this age in idleness and ignorance, it is most difficult to change their habits or cultivate their understandings.*" Other conditions should be, that they be free from bodily defect or infirmity, and that those who have charge of them, give *written* consent, that when of proper age they shall be placed with their own free consent as private soldiers in the regular Army.

I am inclined to suppose that these Primary Schools would be supplied with pupils to some considerable extent by the Grown Children's Army Schools, and *gradually obviate the present necessity for adult army schools*, a necessity which is beset with inconvenience. The following experience on the subject is extracted from the Reports:—"During the drill season it is impossible to get any large or regular

"attendance of men at school.* Finding such to be the case, I have "for the last two years instituted a *special class*, who are excused cer- "tain duties, and by this means I trust in course of time to give "every man a certain amount of education." The institution of a *special class* is an example which I think might be advantageously followed in the conduct of the proposed schools. I will, therefore, again presently call your attention to this point of detail.

The proposed written consent of parents or guardians, just now mentioned, may not, at first sight, appear a very hopeful preliminary to recruiting. But the statistics of the Royal Chelsea Asylum and Royal Hibernian Military Schools, hold out the most encouraging prospect in this respect. The authorized establishment of boys at Chelsea Asylum is 500. The actual number on the 31st March was 499, of the following ages. Under ordinary circumstances they are not kept after 14.

Under 6 years	5
From 6 to 7 years	14
„ 7 to 8 „	23
„ 8 to 9 „	51
„ 9 to 10 „	54
„ 10 to 11 „	64
„ 11 to 12 „	89
„ 12 to 13 „	91
„ 13 to 14 „	92
„ 14 to 15 „	15
„ 15 to 16 „	1
	499

During the years 1861, 62, 63, 64, 65, and 66, there were of boys whose time had expired—

Fit for the Army	345
Unfit	67

269 volunteered for the Army, 5 remained as monitors, 119 were delivered to their friends. The proportion of those boys reported "fit," who volunteered for the Army was the same in 1865 as 1864, viz., 75 per cent. Of 521 children trained in the schools, and afterwards enlisted in the Army, 6 have by their conduct and talents raised themselves to the grade of Commissioned Officers. Less than 3 per cent. are classed as bad characters, and only 6 per cent. as indifferent.

From a return from the Royal Hibernian Military School, it would appear that of 81 boys whose time had expired during the twelve months ending the 31st March, 1866, 67 boys were reported fit for the Army, and that of these 49, or 73 per cent., enlisted for the Army, while 4 remained as monitors; 14 boys, or 17 per cent., were reported unfit for the Army, and of these 2 were appointed to trades.

* See also the quotation at pages 15, 16, and 17.

ABSTRACT of the number of Boys formerly in the Royal Hibernian Military School, and serving in the Army on 1st January, 1866.

Rank.	Number in each Rank.	Character.	Number.
Officers	8	Exemplary	49
Bandmasters	7		
Sergeant-Majors	1		
Enlisted Schoolmasters	13	Very good	155
Quartermaster Sergeants	3		
Troop Sergeant-majors	1	Good	596
Colour Sergeants	16		
Trumpet and Drum-majors	12	Indifferent	39
Sergeants	40		
Orderly-room Clerk	1	Bad	16
Paymasters' Clerks	3		
Lance Sergeants	2	Very bad	4
Corporals	44		
Lance Corporals	14		
Bombardiers	17		
Musicians	677		
Drummers			
Gunners			
Sappers			
Privates and Boys			
Total	859		859

Canon Moseley considers that one-half the boys who leave the Chelsea Asylum have received a really good education. About one-third receive an education which he considers to be equal to that obtained by the best instructed boys of an ordinary national school. One-eighth or one-ninth are backward boys, whom it is difficult to teach, a class to be found in every school, but represented perhaps more numerously in other schools than here. About one-twentieth of the boys are of a class whom it is nearly impossible to teach—constitutionally dull, or incorrigibly idle.

If a certain per centage of the lads educated in the proposed military training schools had to be delivered over to their friends at the expiration of their school period, the education, discipline, drill, and industrial training received, might not be lost to the Army in some critical emergency, and would certainly be a gain to the community under any circumstances. With certificates of good conduct and such a training, they would be sought for as orderly and effective workers. It should also be made a point to impress upon the pupils of the primary schools, on joining the Reserve and Army, that, whether or not the opportunity should be presented to those holding a good school certificate of deriving material benefit from it whilst in the service, it would certainly be of use to them if coupled with a certificate of good conduct, when seeking employment after the completion

"attendance of men at school.* Finding such to be the case, I have "for the last two years instituted a *special class*, who are excused cer- "tain duties, and by this means I trust in course of time to give "every man a certain amount of education." The institution of a *special class* is an example which I think might be advantageously followed in the conduct of the proposed schools. I will, therefore, again presently call your attention to this point of detail.

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If a certain per centage of the lads educated in the proposed military training schools had to be delivered over to their friends at the expiration of their school period, the education, discipline, drill, and industrial training received, might not be lost to the Army in some critical emergency, and would certainly be a gain to the community under any circumstances. With certificates of good conduct and such a training, they would be sought for as orderly and effective workers. It should also be made a point to impress upon the pupils of the primary schools, on joining the Reserve and Army, that, whether or not the opportunity should be presented to those holding a good school certificate of deriving material benefit from it whilst in the service, it would certainly be of use to them if coupled with a certificate of good conduct, when seeking employment after the completion

of their period of service. I have no doubt after a few years such certificates would be found certain passports to employment in all offices of minor trust, in the constabulary, the railway and telegraph services, &c., &c. It would, indeed, be good policy to make them so. But perhaps you will think I am laying more stress than necessary on the civil destiny of the lads passing through the proposed schools; but if you reflect for a moment, you will perceive that the kind of training suggested for these schools would make "effectives" for many civil employments; the schools would have, on this account, an equal, if not stronger, claim to support upon the Educational, as upon the War Department. There would, therefore, be strong grounds for appealing to the former to contribute to the establishment and maintenance of one such school at least, in every county, for soliciting the consideration of the proposed military seminaries in any future scheme of general education; not that I imagine, with a well organized plan of industrial training, the expense of maintaining such institutions would be very great.

The statistics of the Royal Chelsea and Hibernian Schools, although sufficiently encouraging, must necessarily fail to give any adequate idea of the aid the proposed county military training schools would lend to recruiting the Army. The two model schools referred to, are only open to soldiers' orphans, who are admitted without any physical or educational qualification. But the county schools would be open to all comers physically qualified, able to read and write, and well recommended. The proposed schools would open, as it were, new gates to employment and promotion, which would soon become known in each district, and be regarded as promising openings to the lads of the industrial classes, as well as to the sons of soldiers. Let us, however, attempt some sort of speculative calculation as to the number of recruits the county military schools would send into the Army. Take the number of military districts at 85, equal to that of the counties in England, Scotland, and Wales, and let a hundred boys be annually admitted to each of the primary schools, commencing January 1st, 1870, then on the 1st of January, 1873, of the 25,500 lads in training, 8,500 (their school term having expired) would be transferred to the Reserve, the same number in 1874, 1875, and 1876, in all 34,000, and of course their vacancies supplied in the schools. But on the 1st January, 1876, 8,500 men being due to, would be passed from the Reserve to the regular Army, leaving 25,500; 8,500 men would also join the Army on January 1st, 1877, 1878, and 1879. On January 1st, 1879, however, 8,500 would complete their stipulated (first) term of service, and be entitled to their discharge. Thenceforward there would always be 25,500 boys in training, 25,500 recruits in the Reserve, and 25,500 men in the Army. These are results not to be despised, though made on an assumed quantity, which, I think, you will agree with me, might be increased in practice. The foregoing calculation, too, does not include the Officers and non-commissioned Officers who would be added to the Army by the middle and high schools, nor attempt to estimate the number of men to be derived from the other portion of the proposed Reserve force, which

would be attached to that emanating from the schools for a certain number of days* during the drill season.

Three or four years' service in this division of the Reserve should exempt working men from further call for military service abroad; and to this branch the pensioners of the military school system would be returned.

I have only briefly alluded to an educational grant as probably affording the means to establish and maintain these schools; but I believe the nobility and gentry of the country, once convinced of their importance, would soon hasten to endow and render them independent of any other pecuniary aid.

I do not propose that any great extension of education in a literary direction should be the main feature of the primary schools, but that certain degree of instruction, which together with industrial training and regular drill, is calculated to make the intelligent, self-helpful, and generally useful soldier. But I would institute a *special class* for those lads who should display superior mental abilities, and, as in the Army schools, exempt those composing it at intervals from some of the more laborious duties. The objects of a *special class* will, perhaps, be better understood from the following extract from the report of Lieutenant-Colonel Gleig, who in reporting upon the 1st depôt battalion, where the education of the soldier is much encouraged, remarks, "The schoolmaster has his Commanding Officer's orders to send away "the least instructed for whom he may not have room, and to keep "for further instruction those who have already acquired some know-"ledge of the subjects usually taught. It is the Commanding Officer's "opinion, that *these*, and not the entirely illiterate, are the men whom "it is most to the interest of the service that the schoolmaster should "take in hand.†"

The school course should comprise :—

Religious instruction.
Arithmetic.
English history.
Geography.
Grammar.
Dictation.
Model drawing.
Vocal music.
Instrumental music.

Industrial training as—

Carpenters.
Smiths.
Wheelwrights.
Shoemakers.
Tailors.
Tentmakers.

* These would be better distributed than twenty-one days together, as in the Militia: twenty-one days together would be quite out of the question for working men, for whom this portion of the force is designed.

† Fourth Report, 1866.

It would, perhaps, be inexpedient to carry on industrial training in all these crafts in one establishment; some might be practised in one district school, some in another. But I would suggest that there should be farm land attached to all the military schools, and that all hands in the lower schools should be employed at certain seasons in agricultural labours; the experience so obtained might render the lads at some time or other more useful as soldiers, and the time must come, perhaps is already come, when rifle, pick, and spade must journey together. A friend of mine thinks that the muzzle of the rifle should be contrived to alternate between spade and blade.

In suggesting the length of, and the divisions of the term of service, it is of course at a theoretical venture which would require modification and welding to the existing state of things, and conditions only applicable to men who may have passed through the County Military Schools. I am, however, intuitively inclined to favour short periods of service. The moderate term proposed, would enable men entering the Army to look forward to civil employments in the prime of life, in the event of their changing their military minds, and wishing to leave the Army. There is, however, the possibility, the probability, that many men would prefer remaining, and prolonging their term of service, if the conditions offered were to be made sufficiently favourable. To promote, to ensure such a result, I would propose that there should be two other terms of service, of three years each, in the regular Army, which would make the whole period from entering the schools to the soldier's final discharge, fifteen years. For each of these additional terms there should be a bounty, which should be paid at the soldier's option, either at the beginning or end of each term of fresh enlistment, and which, in case of a man falling or dying, during either of these periods of service, if not previously received, should be paid to his nearest relative. And further, that in case of payment of bounties being deferred till discharge, at the end of fifteen years, a soldier should have the option of receiving full payment of bounties, or a pension, but in case of choosing to be pensioned, the country to have a further claim upon him for service in the Reserve till the age of forty. If disabled in the service, the soldier to receive full pay of bounty or bounties and a pension. By such means, and by degrees, I believe, we should have not only a considerable and valuable force of thoroughly trained men in the ranks, but also a force of capital soldiers scattered through the land in civil employments, who would be sure, in larger or smaller numbers, to gravitate to the ranks again, in that collapse of industries which inevitably succeeds the declaration, and continues during the prosecution, of war.

The promotions to the middle school would, as a rule, perhaps, be made for that *special class* of lads displaying most capacity, and who, on that account, would have extra opportunities afforded them of acquiring knowledge. I must now pass on to the further consideration of the middle school.

Middle School.—In this department the course of instruction would have a wider range, its professed object being to prepare the lads for the Engineer corps, and as Non-Commissioned Officers. Here I

require more experience and knowledge of detail than I can possibly pretend to, and will, therefore, only subjoin the time table of the normal school of the Royal Chelsea Asylum, as probably suggesting an approximate notion of the kind of studies, and the time which should be devoted to each.

WEEKLY Distribution of Time in the Normal School of the Royal Asylum, Chelsea.

	1st Class.	2nd Class.
	Hours.	Hours.
Religious instruction	2	2
Writing papers on scriptural subjects ..	1½	1½
Mathematics.		
Arithmetic	1	2
Algebra	2	2
Euclid	1	2
Mechanics	1	0
Trigonometry	1	0
English history	2	2
Do. grammar	2	2
Reading	2	2
Geography	2	2
Fortification	2	2
Model drawing	3	3
Vocal music	4	4
Chemistry	2	2
Physics	2	2
Private study	7½	7½
Examination	2	2
Drill and gymnastics	6	6
Total	45	45

In the general drill which would take place daily, or at regular intervals, the lads of the middle school would take their relative grades as Non-Commissioned Officers.

The High School.—I propose that the course of study in this department shall be entirely scientific, an exception being, perhaps, made in favour of some of the modern languages, and should comprise:—

Pure Mathematics.

Section 1.—Arithmetic.
Algebra.
Euclid.
Plane Trigonometry.

Section 2.—Spherical Trigonometry.
Elements of co-ordinate geometry
Differential calculus.
Integral calculus.

Mixed Mathematics.—Statics.
Dynamics.
Hydrostatics.
Modern geography.

Experimental Sciences.—Chemistry.
Heat.
Light.
Electricity.
Magnetism.

Natural Sciences.—Mineralogy.
Geology.
Free-hand drawing.
Geometrical drawing.
Permanent fortification.
Field fortification.

According to the plan suggested, the *general* educational attainments of the students of the high school would be tested by the examination for admission.

This would have the advantage of dividing the term of study into two periods, which, I think would be a boon both to the tutors and tutored. The work of both periods would be easier done, better done, and more indelibly impressed upon the memory. Time should, of course, be set apart for *keeping up* the attainments of the first course. And commissions should be periodically awarded for excellence.

The course of study in the high school should be sufficiently comprehensive to enable men to pass examinations for any of the Government appointments, military or civil. Those special military subjects which would slightly extend the range of study of civilians, I think should be absolutely required of all candidates for colonial, if not for all important Government appointments. And a diploma, or permission to use the affix H.M.S. (High Military School) should give preference in all appointments to the Army, the Reserve, the Militia, or the Volunteers.

I would also suggest that the depôt battalion of some regiment be located in the neighbourhood, or at no great distance from the military school. To this depôt all the recruits of the district should be passed, so that a particular regiment would gradually be associated with a particular district, a condition which I believe would materially promote the general or open recruiting in that division of the country; and that men passing their first period in the Reserve, should, if qualified, and so desiring, be transferred to the Army before that period expire.

Not one of the least advantages of this system would be its applicability to the colonies. It would link together the home and colonial military organizations, and prepare an effective nucleus of a defensive force in each of our colonial possessions ready to be supplemented on emergency with troops from England, and possessing that local knowledge, the want of which so often leads to unnecessary sacrifice of life and to disaster.

In concluding the exposition of my scheme, it will perhaps assist you to grasp the proposal in its totality if I give a brief summary of its salient points. The County Military Training Schools are of course the basis of the system. The Primary Schools keeping up, according to the calculation adopted, and independently of any other source, 25,500 men in the Reserve, and 25,500 men in the Army. These men would, moreover, be skilled handicraftsmen in those special industries calculated to render an Army independent. Then there would be the Middle School, supplying the Engineer Corps and educated Non-commissioned Officers, whose numbers are not included in the estimated 25,500; if, however, we take 30 as the number of boys annually admitted to each of the schools in this department, that estimate would have to be increased to 28,000. Then there would be the High School, preparing men for commissions in all branches of the service for the Army, the Reserve, the Militia, and the Volunteers, and not only designed to give able men to the military but also to the civil service, for it is important with such extensive colonies, and comparatively so small an Army, that men holding civil appointments should have that amount of military education which would enable them in any case of rebellion to organize their countrymen, and the available resources of the station for defence, to the best advantage. The High Schools should in fact be seminaries where men should be prepared for important posts. The school-system, too, provides for the promotion of talent from the primary to the high department, so that every boy entering the lowest grade would know that the highest appointments would be open to him, should he display the requisite ability. The scheme also suggests the associating, the identifying a regiment with a particular military district and its training schools, the depôt of that regiment being near the military schools of the district, and the head-quarters of the Reserve as well as of the recruiting staff and depôt battalion. This is looked forward to as eminently calculated to promote recruiting in the district, and to develop an *esprit de corps* not likely to be so well fostered by any other means. To all these advantages superadd that of an Army of thoroughly trained soldiers scattered through the land in civil employments, on account of the moderate term of service, who would stand the country in good stead in case of invasion, and who might not be proof against a good bounty in other cases of need. There is also the proposed extension of the system of Military Schools to the colonies, more especially to those of Canada, Australia, and New Zealand, which would link together the home and colonial military administrations. It is also proposed, under certain contingencies, that the boys from the Primary Schools shall be passed annually to the Reserve, and from the Reserve to the Army, so as to rapidly increase the strength of the latter, and from this source alone, to 100,000 men. Finally I have to mention that branch of the Reserve which would be open to working men for a limited period of home service: the conditions would be similar to those of the Militia, but the drill days distributed over the year, so as not to interfere with their industrial occupations. The institution of this branch of the Reserve would, I think, offer a more acceptable form of service to the artisan than that

of Volunteering or the Militia. To this branch the pensioners of the school system would be returned, and from it many recruits would doubtless be sent up to the Army.

Such, then, are the means by which it is surmised we might gradually establish a common educational bond between the forces of the Empire, calculated to secure unity of action, means which, whatever you may think of their numerical results to recruiting, you will perhaps admit would materially augment the *morale* and general efficiency of the Army, promise to give that intelligence, smartness, and self-helpfulness which make an Army, and gradually convert the *disjecta membra* of our military strength into an organized arterial system. Moreover, that the proposed reform, though calculated to mitigate class distinctions, is sufficiently conformed to the present constitution of the State as to assimilate itself with those social demarcations which have become a national characteristic most difficult to modify, not to say subvert.

Addenda.

The authorized establishment of boys at Chelsea Asylum is 500. The actual number on the 31st March, 1866, was 499. The boys are received between the ages of 5 and 10, and under ordinary circumstances they are not kept after 14.

The elder boys are instructed either in music or trades, the distribution being at present as follows:—

Musicians	91
Drummers and Fifers	62
Tailors	92
Shoemakers	85

The following table shows the number of boys who have been discharged from the Asylum since 31st December, 1860:—

Years.	Number of Boys whose time expired.				Number of Boys reported fit for the Army.		
	Average strength.	Fit for Army.	Unfit.	Total.	Volunteered for Army.	Remained as Monitors.	Delivered to their friends.
1861	410	42	4	46	39	..	6
1862	410	65	11	76	52	3	19
1863	410	92	11	103	77	1	24
1864 (1st Jan. to 31st Dec.) ..	497	69	20	89	43	1	45
1865 (1st Jan. to 31st March)..	497	14	6	20	12	..	8
1865 / 1866 (1st April to 31st March)	496	63	15	78	46	..	17
Total	..	345	67	412	269	5	119

The proportion of those boys reported fit who volunteered for the Army remains the same as in 1864-65, being 73 per cent.

The following table is an epitome of a return drawn up from reports received from the several regiments to which the boys of the institution have volunteered. Of 521 children trained in the schools, and afterwards enlisted in the Army, 6 have by their conduct and talents raised themselves to the grade of Commissioned Officers. Less than 3 per cent. are classed as bad characters, and only 6 per cent. as indifferent.

Rank.		Character.	
Officers	6	Exemplary	28
Staff-Sergeants	2	Very good	149
Colour-Sergeants	5	Good	304
Bandmasters	2	Indifferent	31
Sergeants	35	Bad	12
Drum and Trumpet Majors	10	Very bad	—
Corporals and Bombardiers	42		
Drummers	164		
Privates	255		
Total	521	Total	521

Evening Meeting.

Monday, March 22nd, 1869.

MAJOR-GENERAL THE HON. JAMES LINDSAY, Inspector-General of Reserve Forces, in the Chair.

NAMES of MEMBERS who joined the Institution between the 15th and 22nd March, 1869.

LIFE.

Wilson, A. K., Lieut. R.N. 9*l.*

ANNUAL.

Roberts, H. B., Major Royal Marine Artillery. 1*l.*
Hamilton, C. E., Lieut.-Colonel 80th Lancashire Rifle Vols. 1*l.*
Campbell, F. Lorn, Lieut. Scots Fusil. Guards. 1*l.*
Kennedy, A. F., Comdr. R.N. 1*l.*
Montgomery, W. E., Lieut. Scots Fusil. Guards. 1*l.*
Teschemaker, T. R., Major (h.-p.) R.A. 1*l.*
Fitz-Gerald, J. P., Lieut. North Cork Rifles Militia. 1*l.*

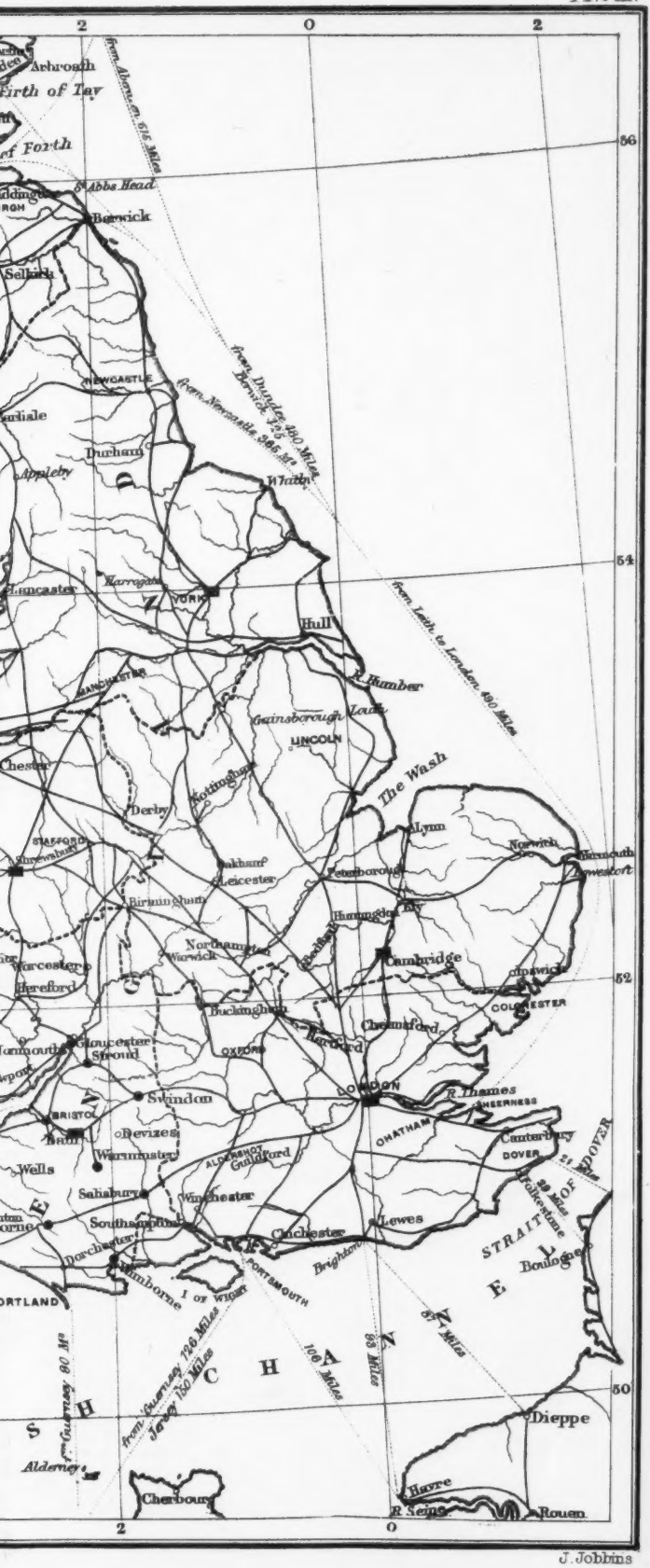
OUR RESERVE FORCES.

A paper prepared by Lieutenant-Colonel MALET, Grenadier Guards; and read by SIR ALEXANDER MALET, Bart., K.C.B.

The CHAIRMAN: I have now the pleasing duty of introducing to the meeting Sir Alexander Malet, who is kind enough to read a paper prepared by his son, Lieutenant-Colonel Malet, on "Our Reserve Forces," which, being a subject at the present moment engaging a great amount of public attention, and also a subject to be almost immediately brought before Parliament, when they go into the next Army estimates, I am sure will be received here with all that attention which it deserves, and to which the ability of its author fairly entitles it.

Sir ALEXANDER MALET: The Chairman and meeting will perhaps permit me to explain in a very few words how I am here, civilian as

6
4
56
54
52
50
Loch Linnhe
Inverary
Stirling
Perth
Dundee
Firth of
Firth of Forth
Dumbarton
GLASGOW
Lanark
EDINBURGH
Peebles
Selkirk
Ayr
Firth of Clyde
Girvan
Kirkcudbright
Dumfries
Annan
Carlisle
Solway Firth
Antrim
Belfast
Down Patrick
Douglas
from Glasgow
Dundalk
from Belfast 166 Mls
Londonderry 250 Mls
75 Miles
260 Miles
Morecambe Bay
Lancaster
Drogheda
from Dublin 138 Miles
DUBLIN
Holyhead
To Holyhead 84 Miles
Liverpool
Rhyl
Chester
Caernarvon
Wicklow
Arklow
Dolgelly
Barmouth
Cardigan Bay
Aberystwith
New Radnor
Worcester
Hereford
Cardigan
Brecon
Carmarthen
Swansea
Monmouth
Newport
319 Miles
284 Miles
Llandaff
Cardiff
BRISTOL CHANNEL
Wells
Taunton
Sherborne
Exeter
Launceston
PORTLAND
Bodmin
PLYMOUTH
Truro
Devonport
Lizard
Guernsey 90 Mls
Alderney
IRISH CHANNEL
ENGLISH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Arbroath
Firth of Tay
Firth of Forth
St Abbs Head
Berwick
Selkirk
NEWCASTLE
Durham
Appleby
Wath
Lancaster
Harrogate
YORK
Hull
R. Humber
Manchester
Gainsborough
Lincoln
Chester
Nottingham
Derby
The Wash
Lynn
Norwich
Yarmouth
Lowestoft
Stafford
Leicester
Peterborough
Birmingham
Huntingdon
Northampton
Warwick
Cambridge
Worcester
Hereford
Ipswich
Colchester
Buckingham
Oxford
Chelmsford
Gloucester
Stroud
LONDON
R. Thames
Sheerness
Swindon
Bristol
Bath
Devizes
Warminster
Chatham
Canterbury
Dover
Wells
Aldershot
Guildford
Salisbury
Winchester
Folkestone
Southampton
Chichester
Lewes
Dorchester
Brighton
Portsmouth
Bournemouth
I. of Wight
Portland
Boulogne
Dieppe
Havre
R. Seine
Rouen
Cherbourg
Alderney
Guernsey
Jersey
from Aberdeen, 516 Miles
from Dundee, 490 Miles
from Berwick, 325
from Newcastle, 296 Miles
from Leith, to London, 400 Miles
80 Miles
120 Miles
100 Miles
85 Miles
87 Miles
21 Miles
CHANNEL
ENGLISH
STRAIT OF DOVER

J. Jobbins

I am, as a reader of a military paper. My son, who prepared it, was abroad at the time when I gave notice to read it at a meeting of the Society of Arts, where, as you are aware, the subject of our Army reformation or re-organization has been brought forward by Mr. Henry Cole; but the matter brought forward was of such length that I did not find room for reading the paper, and I thought it would be more properly read at a meeting of the members of this Institution, where it would also be more likely to be appreciated. I have, however, only one difficulty, viz., that, though the father of the gentleman who wrote the paper, I am not the father of the writing, and that probably I should be unequal to defend the thesis; but as my son has returned, and is, I am happy to say, now present, I have no doubt that, if it is attacked. he will be able to fight his own battle and defend his own positions. I will now, with your permission, read the paper.

An English gentleman was once asked by a foreign Staff-officer, "How many transports do you suppose it would require to convey an invading army to your shores?" Our countryman replied, with perfect candour, "I do not know, but would undertake to send home the survivors in one." Most of us fondly cling to the above condensed estimate of the ultimate fate of an invader, but some impatient spirits would like to see a fair prospect of such a satisfactory result being achieved, say in a fortnight's time, after the landing of the enemy—and these dissatisfied people assert that, as we have in round numbers about three hundred thousand Militia, Yeomanry, and Volunteers in this island—a force certain to double itself on the least symptom of real danger—it is a pity that there should be a chance of a campaign on our territories being extended over a period of three or four months for want of a little timely organization on our part.

Those who advocate the adoption of a grand military system for our reserve forces, are begging no question in assuming that an invasion of England is possible. The existence of the Volunteers proves that the nation at large believes that a certain combination of events might lead to this result. The Volunteers are well aware of their own shortcomings, and demand a proper organization at the hands of Government; but as yet we have heard of no plan emanating from the War Office calculated to give cohesion and efficiency to the heterogeneous elements which we dignify with the name of the "Reserve Army" of Great Britain.

Given, a war declared between England and a continental power, France, for instance, after a sudden and brief dispute—France, with over 1,200,000 well-equipped soldiers, has really an *embarras de choix* for our annoyance. Mistress of the maritime base, "Marseilles, Toulon," she lands a *corps d'armée* in Egypt, and cuts off our communications with India, before we can so much as re-inforce the Malta garrison. Her cruizers land stores, arms, and possibly men to foment disaffection in Ireland. We awake to learn that the population of Lower Canada have not yet forgotten that they are of French origin, and at the same time we find ourselves threatened in the very heart of our empire. Let such a power have but one European ally, and

this danger is magnified to an indefinite extent. Should we fail to take the initiative in the occupation of Belgium, she and her ally will make short work of gobbling up the little territory, while a third power comforts herself with Holland, and we shall have the satisfaction of seeing Antwerp and the Scheldt included in the hostile base of operations against our shores. Ireland would require plenty of troops; all our colonial garrisons would be screaming for reinforcements. If we could throw 30,000 men into Belgium, it would be a severe strain upon our resources.

Let us, then, consider what, under present circumstances, would be our method for utilizing the reserves of Yeomanry, Volunteers, and Militia. As usual, we should begin by robbing Peter to pay Paul. All or nearly all our Militia would be at once embodied, and as soon as each battalion had attained a respectable degree of efficiency, it would be broken up and its Officers disheartened by seeing all their best men drafted into the line. Last year we were promised by the Minister at War a Reserve for the Regular Army of 30,000 men, to serve in war under the same conditions as the line. If we had them they would for a time stave off the depletion of the Militia; but where they are, no one knows. Of course there would be a vast deal of drumming and fifing among the Volunteers; "each Yeoman would draw his battle blade," and the ranks of every corps would be filled to overflowing—in three weeks we should have at least 400,000 men under arms, but how organized? how commanded?

Shall we see each Lord Lieutenant like a baron of old leading his contingent to the war? Will Dorset follow Lord Shaftesbury? and Lancashire cry "Sefton to the rescue!"? What will be the destination of all those picturesque little detachments of light-horse Volunteers who appear by twenties and thirties, in various uniforms, at all Volunteer reviews? There are about 1,300 of them in all, but how are they to be united? Where are the knapsacks and Snider rifles for the infantry?—the horses, waggons, and rifled guns for the artillery? Will the Yeomen be brigaded according to modern theories, or will they act every regiment for its own county in independent glory? Where are the magazines for such an army as might be required to take the field? Where is its train? What system will be followed in supplying the troops with their first and second reserves of ammunition? Is there any field hospital corps? And last, not least, what is to be the administration of this great mass of men? Where is its staff? Will it be formed into corps, divisions, and brigades? Where are the various departments? To all these queries, echo answers alternately "How!" and "Where!"

Does any sane man in England believe that these matters could be put on a proper footing in a few weeks or perhaps days amid the confusion and anxiety of apprehended invasion? The resources of Woolwich—our one great military arsenal—would no more than suffice to supply the needs of the Regular Army, and our garrisons spread over the surface of the earth. As for the staff and administration, it is sheer imbecility to suppose that a system will rise out of chaos at our need. Yet we put off, and hesitate, when a little forethought, and a

moderate expenditure, would insure us against the possibility of a disgraceful disaster.*

No one who will honestly contemplate the necessities of modern war, can doubt that what the country really requires, is a complete reform of our existing military institutions. So far as it goes, the Regular Army of Great Britain is one of the best –if not the best—in the world. Those who believe that all improvements are comprised in doing away with the purchase system, do not know where to begin or where to end. It is certain that an Army, including Reserves, of 800,000 or 900,000 men, such as we ought to possess, cannot be officered on that system; but till we have something better, it may be as well to leave untouched the old-fashioned machinery which for more than two centuries has given us a corps of Officers good and sufficient for their work. Grant that our leaders did not display extraordinary generalship in the Crimea, yet our cruel disasters were the result of one simple cause—we had no Reserves. *Without a conscription we never shall have Reserves properly called;* but reforms, and, above all, military reforms, make but slow progress in a country like ours, which has been so long without enduring the miseries of war.

Sooner or later, the nation will demand a conscription carrying with it a short time of service in the ranks and successive grades in a first and second reserve.

All men of the military age are morally as much bound to serve the State in war, as to obey its laws; but to serve it efficiently they must have learnt discipline and the use of arms, not as Volunteers only, but, as on the Continent, in the ranks. An English Volunteer is at least as much of a military monster as a Field Officer who has purchased his commission.

Pending the time when reason or misfortune shall have roused the nation to a sense of its shortcomings, let us consider the best that can be done with what we are pleased to style our "Reserve forces."

The existing military districts with head-quarters at London, Manchester, Dover, Portsmouth, Devonport, Colchester, Woolwich, Chatham, and Edinburgh, were constituted with a view to requirements totally different from those which have sprung up with the formation of Volunteer corps.

As Woolwich and Chatham are the nurseries of the two scientific services of artillery and engineers, they ought each to remain under the immediate command of a general Officer charged with the administration of his peculiar branch of the service, but subordinate to and included in the first corps of the Southern Army, as presently to be specified.

Let us suppose the remaining seven districts as abrogated or reformed, and in their place, the island of Great Britain divided into three grand military departments, each of these divisions into two sub-departments, and each sub-department, as area, population, and geo-

* Those who doubt the necessity of previous organization are invited to study the unhappy campaign of the 8th Federal Corps, under Prince Alexander of Hesse, in 1866.

graphical position may require, into districts and sub-districts, without reference to county boundaries.

We presume that the regular troops quartered in each sub-department would be *pro tem.* under the command of its military chiefs in the same way as they are at present under the generals of the various districts within which they may be stationed. The only administrative difference between them and the Reserve troops would be that they are always under arms, and not being localized, they may in time of peace be transferred from one quarter to another as at present. They and the various Reserve corps resident in each department compose an Army, comprising two *corps d'armée*, each with fixed head-quarters and separate administration, responsible in time of peace to the War Office for the efficiency of the *personnel* and *matériel* under its charge, and capable of development at any moment into the working staff of an Army in the field. The first and second sub-departments of each grand department represent territorially the first and second corps of each grand Army—districts and sub-districts, the divisions and brigades of reserve corps respectively. This further division into districts and sub-districts has no reference to regular troops, because, as before said, they are not and cannot be localized. It is not necessary that the different *corps d'armée* should be of equal strength, but it is of the highest importance that the great principles which ought to govern the relative proportions of the various arms should be laid down and regulated by Government.

At present we shall find in one county a glut of artillery and a scarcity of riflemen, or plenty of infantry and no artillery; in some parts of the country there are several squadrons of yeomanry, in others, none at all; and so on *ad infinitum*. All these disparities are false distributions of power, and should be promptly reformed by superior authority. The Volunteers are perfectly ready to conform to the dictates of an intelligent administration.

The proposed territorial divisions would then be as follows:—Army of the south, first sub-department, first corps, head-quarters London: counties of Kent, Essex, Hertfordshire, Buckingham, Oxon, Berkshire, Middlesex, Surrey, Sussex, Hampshire, and Isle of Wight. Second sub-department, second corps, head-quarters Bath: counties of Wiltshire, Gloucester, Monmouth, Glamorgan, Carmarthen, Hereford, Pembroke, Brecon, Dorset, Worcester, Somerset, Devon, and Cornwall. Midland army, first sub-department, first corps, head-quarters Cambridge: counties of Suffolk, Norfolk, Lincoln, Cambridge, Nottingham, Northampton, Leicester, Rutland, and Warwick. Second sub-department, second corps, head-quarters, Shrewsbury: counties of Derby, Cheshire, Flint, Denbigh, Carnarvon, Anglesea, Stafford, Salop, Montgomery, Merioneth, Radnor, Cardigan. Army of the north, first sub-department, first corps, head-quarters, Edinburgh: the Kingdom of Scotland and islands. Second sub-department, second corps, head-quarters York: counties of Northumberland, Durham, York, Cumberland, Westmorland, Lancashire, Isle of Man.

The subdivision of these departments into districts and sub-districts, with divisional and brigade head-quarters *for the reserves*, can only be

made after careful consideration of the geography, population, and strategical conditions of the country, and does not come within the scope of a paper, which seeks only to arrive at certain general principles. It is sufficient to say that they must be selected with an eye to the concentration of men and the distribution of the material of war; and the head-quarters should be, as a rule, at the junction of two or more lines of railway. In the second sub-department of the southern army, such places as Carmarthen, Swansea, Launceston, Bodmin, Bristol, Exeter, Gloucester, Sherborne, Stroud, Wimborne, Warminster, Salisbury, Swindon, and others, seem designated by their position as points of *rendezvous* for the various corps preparatory to their union as an army. Should experience prove them to be so adapted, they would become brigade and divisional head-quarters, and the military capitals of districts and sub-districts.

On the danger of war becoming imminent, each of the three grand armies will receive a Commander-in-Chief and Staff, chosen by the Minister at War. The staff of the six sub-departments will be of limited numbers in time of peace, but permanent and most carefully selected, as on their industry and intelligence will depend the efficiency of the various divisions for war.

Each of these six head-quarter staffs will consist of a Lieutenant or Major-General of the regular Army, as Commandant, one Aide-de-Camp, an Assistant Adjutant-General and his Deputy, an Assistant-Quartermaster-General and his Deputy, a Colonel on the Staff as Chief of Artillery, a Principal Medical Officer, and at least one Staff-Surgeon, charged with the organization of the medical department of the Corps, an Officer of the Commissariat, with a due proportion of clerks, and one or two experienced officers of the military train, to form from the local resources of the country the germ of a sufficient Army Supply train.*

The brigade and divisional commands of reserve troops would be held, as in the Army, for five years; in time of peace carrying half pay. They should be bestowed, by selection of the War Office, on Officers resident in or connected with the district in which their commands are situated, who have served in the regular Army.† Their Staff should be in abeyance in time of peace; and appointed by the Corps Commander, subject to the approval of the War Office, on the first symptom of approaching hostilities.

It has been said above that no inconvenience is likely to arise from an inequality in the size of the various corps, but the importance of fixing the proportion of the various arms each to each cannot be overrated. These proportions, according to received authorities, appear to be about as follows in an Army of 51,000 men, viz.: 52 battalions = 35,000 men, 42 squadrons = 6,500 men, 24 batteries, 5 of which ought to be horse artillery = 144 guns = 4,000 men; engineers 1,500 men; add staff, waggon train, hospital corps, telegraph department, &c. =

* To this estimate must be added, of course, the necessary divisional and brigade staff of any regular troops quartered in the department, as at Aldershot, Colchester, Dover, &c.

† These General Officers would replace the existing Inspectors of Volunteers.

4,000 men, and we have a grand total of 51,000 of all arms in this estimate. The waggon train will be a small one, as a great part of the Army stores will be moved by rail. Now we have in England and Wales 94 battalions of Militia, in Scotland 11, and of Rifle Volunteers in England and Wales 150 battalions, in Scotland there are 46, giving 301 battalions as against 138 squadrons, assuming each regiment of Yeomanry to consist of three squadrons. As for the Artillery, it is extremely difficult with the data at my disposal to arrive at any result. Of Militia Artillery we have about 94 batteries, all fit for garrison duties only, at least they neither have nor have ever had field-pieces. Of Artillery Volunteers we appear to possess about 350 batteries in England, Wales, and Scotland; that is on the assumption that each Captain in the Volunteer Artillery list represents a battery commander; but of these corps only a very small proportion are trained or provided with field-guns—none of them, to my knowledge, are in possession of rifled pieces. No force, however, is so difficult to improvise as an efficient field artillery. Of Engineers we have 62 companies, in what state of efficiency it is impossible for me to say; of military train and hospital corps—so requisite for the welfare of an Army in campaign—we have among the Volunteers no vestige.

Assuming that the above proportions for the various arms in a body of 50,000 men are approximately correct, it is obvious that the duty of Government would be to prune the exuberance of certain arms in some parts of the country, and to foster their development in others. If a working Army is ever to be formed, the field batteries will require the most careful and anxious supervision: the men should receive an increased capitation grant, and be assembled for training for two months in each year.

Here I am met by the allegation that it is impossible for Volunteers to acquire such a cohesion and knowledge of their duties as to become an efficient field artillery. My reply is that 400,000 reserve troops must have a due proportion of artillery; that the regular establishment is totally inadequate to meet such a demand; and that the nation which encourages the services of these men is bound to arm and instruct them efficiently. Supposing the three grand Armies to be mobilized, and to consist of 100,000 men each, their proportion of artillery is 900 guns; how much can Woolwich do towards supplying this number horsed and manned? We cannot blow hot and cold; either the Volunteers are useless, and had better be disbanded, or they are necessary to the national safety: if the latter, we are bound to place them, as regards armament, on a footing with regular troops.

I admit that a Volunteer artillery will be greatly inferior to that of the regular Army, but it will be better than none at all: and a little liberality, a certain allowance of instructors, and horses, say for two guns, and their proportion of waggons per battery allowed to be hired during two of the summer months at the expense of the country, would do wonders towards improving the force.

At least half of the existing force of artillery would be required for coast and garrison batteries: the remainder ought as soon as

possible to be supplied with muzzle-loading rifled guns; each battery so supplied ought, if possible, to be kept in a barrack or Government store; but the battery Commander should be held responsible for the serviceable condition of his guns and harness. Evidently in assuring the due distribution and harmonious working of a reserve *Corps d'armée*, its Staff Officers will have a fine field for the display of their energy and talent. The Staff college, or a succursal thereof, should be open to Officers of Militia, Yeomanry, and Volunteers, under the same conditions as to Officers of the Army. As the troops of the Reserve must of necessity be in some respects inferior to regular soldiers, it is the more essential that their leaders should be well grounded in military science.

Each corps should have its permanent depôt established in the vicinity of its head-quarters: here should be kept its pontoon train, engineers' park, camp equipage, hospital implements, field-guns and small-arm ammunition, and, above all, a certain quantity of waggons and harness under proper charge, as a nucleus for the material of a military train, to be supplemented by taking the country carts on requisition when necessary.

All commissions should emanate from the Crown.

The ill-defined and useless jurisdiction of the Lords Lieutenants in local military matters should cease.

Uniformity of dress among the Volunteers should be inculcated; and by degrees, and with a due regard to sparing the men useless expense, insisted upon.

For administrative purposes the various scattered companies of Volunteers should be known only as companies A, B, C, D, of such and such a battalion, and battalions numbered in each grand Army, as for instance, company B, 12th battalion southern Army. As the Militia and Yeomanry probably cling with some prejudice to their territorial designation, it may be good policy to permit their retention.

Every battery, cavalry regiment, and battalion must be inspected twice a year by the corps Commander.

All waggoners and carters should be encouraged to join a Volunteer waggon corps.

Every volunteer should be served out with a knapsack, water-bottle, and havresack; he should be in possession of a great coat, and be made to parade in heavy marching order once a month. All the infantry should be supplied with breech-loading rifles. Every horse in every parish should be borne on a register, corrected half-yearly, and furnished by the district tax-gatherers to the corps head-quarters. The same regulations apply to all carts and waggons.

Each battery, battalion, and squadron should have its brigade or divisional rendezvous permanently assigned, and should proceed thither on receiving the route after the mobilization of the corps has been decided on.

Now taking the second corps of the southern Army, and supposing it to be organized on the principles which I have so briefly and imperfectly sketched, let us observe the process of mobilization, and endeavour to arrive at a conclusion as to the amount of time requisite

for having the whole mass of troops assembled by divisions, and ready to move on any given point.

On Saturday, May 31st, Her Majesty in Council decides on mobilizing the southern Army. Lieutenant-General A. B. is appointed to the command: he fixes his head-quarters in London, and occupies himself with the formation of his staff. The War Office sends down an increase of staff sufficient to each corps Commander. At mid-day, on Sunday, June the 1st, the necessary warrants and instructions are in the hands of Major-General Y. Z., commanding the second corps: he at once telegraphs to all brigade and divisional Commanders to proceed to their respective head-quarters; also orders all brigade and divisional Staff-Officers, who have been already selected, on the first apprehension of hostilities, to join their immediate chiefs. By midnight on Monday the 2nd, all are at their posts. Traffic is suspended on the railways, except under the special permission of the Quartermaster-General. The Yeomanry are united by squadrons, the Infantry by battalions, the field artillery by batteries at sundown on Tuesday. On Wednesday, the Captains of field batteries, and Officers of the train and commissariat, duly furnished with requisitions, proceed to lay hands on all waggons and horses necessary to complete the equipment of their several departments.

As fast as the train is organized, the waggons are directed in due proportion upon the divisional points of concentration. Strong fatigue-parties are told off to every railway junction to assist in loading and unloading stores.

A Provost-Marshal is appointed, with deputies to each division.

By the time the necessary distribution and accumulation of supplies is effected, and the battery and train-horses got into something like working order, it is Monday the 8th: on that night Major-General Y. Z., having received satisfactory reports from all sides, orders the concentration by divisions or brigades to begin; for this and the formation of the various camps or cantonments we allow till Thursday. Friday, Saturday, Sunday, and Monday are devoted by the corps Commander to a personal visit to each division and brigade; and on Tuesday the 16th, he telegraphs to General Sir A. B. that his corps is échelonned in divisions, fully supplied with all requisites, and ready to move as may be directed.

This is no exaggerated picture of what may be done in a country of such vast resources as Great Britain, permeated by railways in every direction: supposing the system to be applied simultaneously to each corps, we have in sixteen days 300,000 men ready to take the field.

The advantages claimed for this plan are—Firstly, that it leaves the regular troops disposable for foreign service; and as in war the best system of defence is one which combines itself with offensive operations, the benefit is obvious. Secondly, it lies at the option of the Crown to mobilize only one or two corps, or only certain divisions or regiments in each department, as may be deemed best, without impairing the working efficiency of the remainder. Thirdly, that the expense of keeping up a permanent nucleus of staff and war material

for each corps will be more than repaid to the country in the sense of security engendered by our being in a measure prepared for the extremities of war. Lastly, that the proposed territorial division of the island is an inexpensive alteration rather than an expansion of our present administrative system.

The CHAIRMAN: After having heard so admirably read and so well expressed a paper, I trust we shall have a good discussion on the merits of the proposals which you have now placed before you. We shall be happy to hear any gentlemen who may be pleased to make any remarks upon that subject.

Colonel ALCOCK, Commandant Rl. East Middlesex Militia: Mr. Chairman—As you have invited discussion, I will venture to say a few words, although as I know the author is ready to fight his own battle and to defend his own positions, it is perhaps rather a hazardous thing to do. I attended to the excellent paper which has just been read; the points which attracted my attention I take the liberty of noticing merely as subject for discussion, namely, those of the necessity for forming *corps d'armée*, and the necessity for conscription to supply them with men. With respect to the advantage of *corps d'armée*, there can be no doubt whatever that Colonel Lecomte, in his excellent historical work, which is in our library, gives his decision in favour of them. He says in the time of peace it is the most rational organization, although in time of war it does not give absolute superiority, inasmuch as in the last campaign the only *corps d'armée* improvised and mixed, was that of General Falkenstein, and this effected some of the most dashing exploits of the war. With respect to the conscription, that is rather a larger subject, because everybody knows that the Continental powers have 5,500,000 men, either actually under arms, or ready to be put under arms, and all those nations have their different peculiarities, characteristics, and military ability of different kinds. Well, of course, the effect of that organization is that the preparation for war is more expensive than war itself, and although it may not seem quite clear at first, upon consideration it will be evident that as the preparation is continuous, and the war itself may be brief, the preparation for the war is actually more expensive than the war itself; and as our system is a defensive and not an aggressive system, it follows that our system being continuous, must not be expensive. I think that is quite clear; but the advice given to us by Mr. Cole in his lecture, I have reason to suspect was rather too favourable with respect to Switzerland. As far as I recollect, he stated that it came to 10*s.* a man. Since that I have received a letter from Switzerland, in which I find far from that being the case, that the population of Switzerland is 2,000,000, and that it has a militia of 200,000, costing the country £355,525, or about £1 14*s.* per man, or 2*s.* per head of the population.* I take the liberty of mentioning that, because as all these matters turn on economy, it will be giving rather a false idea to suppose that even the Swiss can do what Mr. Cole believes to be the fact. He assumes that with this inexpensive arrangement they have always been able to hold their own, but my belief is (those who are acquainted with history know better than myself) that there are several instances—1799, I think, 1803 and 1815, perhaps, when they did not altogether hold their own. However, returning to the subject of conscription, or a modification of conscription, for of course our means of defence or preparation for defence must be based upon our customs, our antecedents, and our national character; therefore, instead of conscription, if I might mention the ballot, I think I could show that the ballot might be introduced without being either oppressive or inconvenient in any manner whatever. It is generally supposed that the ballot is of the same nature as a conscription in which the person drawn is to give his services. Now it so happens that the arrangement that took place when the ballot was in force, and which I believe is legal by the Act of George III, was that militia clubs were formed. They were called militia clubs, and were formed of a certain number of men who were liable to be drawn by the ballot—say ten men.

* I am informed, besides this, that Switzerland has contracted a loan of £480,000 for the transformation of its rifles on the Peabody system.—T. St. L. A.

The calculation was that one of these would be drawn every five years. Well, these men subscribed, according to the rate a substitute would cost, perhaps, a shilling a head every week, till the required sum was in the club. At present it would probably be 3*d.* a week per head. The effect of that was, that the club of these ten men having subscribed the sum, say 1*s.* a week for 13 weeks, would make £6 10*s.* altogether, and having raised that sum, the price of a substitute if one of the men is drawn, they put the money to the stock purse of the regiment; the regiment goes on always recruiting, as it did before; there is nobody distressed. The thing is extremely simple if its working is understood, because it only amounts to a tax upon those men who do not actually serve, and the class of men who are taken and paid for according to the price of labour in the labour-market—those are the very men whom it is valuable to get, because they are men who go ultimately to the Army, and finally are ready for foreign service. That is exactly the thing which we do require. My own idea is—perhaps I may be wrong—that it would be exceedingly easy to introduce a ballot by degrees. Inasmuch as all the militia regiments have an excellent staff, adjutants and everything ready, there is no difficulty in it whatever, whereas at present not only you do not accommodate the time of service to the requirements of the labourer, but you actually draw the line so hard that you cannot have in a militia regiment any single man who cannot give 28 consecutive days to training, and therefore you actually exclude the very man that you want. Every man in a militia regiment who has been trained, and who from his good character gets a situation, will purchase his discharge, or leave the regiment. Now that man ought to have been retained. It is self-evident that having drilled the man, he being valuable, you should retain him, although he cannot give the 28 consecutive days' training which is required by law as it at present stands. I do not like to venture farther upon the subject, for fear of raising, perhaps, some hostile objection to my views, but I think it is a very fit subject to be discussed in this Institution; seeing the colossal preparations for attack that are made by other countries, it is quite right that in this Institution we should discuss what would be adequate and proportionate means for the defence of our own.

Sir Harry VERNEY, Bart., M.P.: Mr. Chairman—I came to-night in the hope of hearing many Officers who have considered the subject, and are much more qualified to address the meeting than I am. I hope to hear their opinions upon this, which is certainly one of the most important subjects that can invite the attention of military men. I am very anxious that those who take up this subject should really consider what we shall probably be exposed to in case of war. Now the paper we have listened to supposes that we are engaged in war with France, and that an enemy would be sent to our shores, who might, perhaps, effect a landing. Colonel Malet referred to the old English gentleman, who thought one ship would be able to carry back those who might survive such an undertaking. My belief is, in case we were engaged in war, we should be very suddenly exposed to invasion, not on one point, but on several. I should think nothing would be more easy than to collect three or four armies in France, each of which would be perfectly ready to attempt to make a descent upon this country, and I believe also they would not be at all terrified by the apprehension that one small ship would take the survivors back. As it would be easy to collect such Armies, it would be very unwise to look at this subject without considering the real danger that we may have to meet. I am quite sure that is what we all do desire to contemplate. I think the danger would be nothing less than that, that we should be exposed to attack, not from the ports of France alone, but also possibly from the ports of America and other countries, for we must contemplate the possibility, not of being engaged in war with one foreign power, but with several. The prize of this country is something so enormous, the booty to be obtained here is so much greater than that of all the rest of the world put together, that we must not suppose if we were engaged suddenly in war, it would be only one country that would endeavour to effect a landing on our shores, but my firm belief is, that very likely we should be attacked by two or three countries. We must always recollect the changes that have taken place within the last few years. Iron ships are now possessed by Prussia, by Denmark, as well as by France, America, and Russia. These powers are in the possession of iron ships that are perfectly able to

cross the seas, and notwithstanding all the gallantry and skill of our sailors, who shall say that in dark weather, supposing there were several fleets endeavouring to reach the coast of England, one or two of those fleets might not be able to land two or three armies of, say, 20,000 or 30,000 men upon our shores? My belief is, notwithstanding the utmost gallantry and skill of our sailors, that is the sort of danger we ought to be prepared to meet. Now I cannot help doubting one proposal of the gallant Officer who wrote that paper, and that is, to divide our country by red lines in the way he has done, instead of localizing it more into our counties. I dare say he has had some very good reason for proposing that, but I have always thought that forces being connected with different counties, and also regiments connected with those counties, would the better assist each other, and would materially tend to the force and efficiency of the Army. I quite concur with him in the sentiment that the nation which called forth Volunteers is bound to instruct and arm them efficiently. There can be no truer sentiment than that, and it is one we ought to endeavour to impress upon our Government. Now I know that when an invasion was formerly apprehended, all these things were perfectly and efficiently attended to, because I have in my own possession all the proposals that were made in the early part of this century, and I know every line of hills which was to be defended, was fixed upon; that the county magistrates and all parties concerned were perfectly prepared; that every detail was settled where corps were to meet, where they were to be brigaded, where ammunition was to be sent to, and in short, every precaution was taken—I have it all in the handwriting of the Officers in charge of it—to resist invasion. I recollect at that time, some 40 or 50 years ago, an old man called upon the Adjutant-General one day at the Horse Guards. He came into the office and said, "Sir, I have got eighty waggons, each with eight horses, and carters to look after them, and I beg to place them at the disposal of the Government, to be sent at any moment to any place the Government may think right." He said "My name is Russell." He was the owner of "Russell's flying vans," and some of my contemporaries may recollect that on the Great Western road we used to see Russell's flying vans, with eight horses each, going to Exeter and to Plymouth, forty or fifty years ago. There is one subject to which, when considering the importance of our Reserve Forces as a means of defending our country, we ought not to shut our eyes, and that is the very great importance of having our railways upon one gauge. I do think with reference to the defence of our country, there is not anything more important than that. I recollect Sir Willoughby Gordon giving evidence upon that subject. He was asked what was the objection to the two gauges, and he stated that the inconvenience would be about the same as that of a ferry; that the inconvenience of moving from one gauge to another was as great as it would be to cross a river by a ferry. I think I heard a word about "short service" in the paper read to us. Now it is my firm belief, if the infantry of our Army were enlisted for a short service, instead of a long one, we should get a very superior class of men, and that among them we should find those who at the end of their service would be willing and desirous to be enlisted into our reserve, and so would form the most efficient reserve we possibly could have. That subject will shortly be brought before Parliament, and I sincerely trust it will receive the attention it merits. But I should very much like to hear the opinions of some military men here, whether an infantry soldier could not be rendered efficient in 4 or 5 years, considering that he probably would be a very superior man to what he is now, for I suspect that almost in every family in England you would find young fellows who would like very much indeed to enlist in the Army, if they could serve four or five years, instead of eight or ten, and if you had a more intelligent class of men, surely you would have time enough to make them good soldiers in so short a time as that. It has always appeared to me that a man could be made a good soldier in a period of that nature. Then I own there is another point I should like to see introduced into our "Reserve forces." I should like to see them brigaded for a much longer time than they are now. I cannot conceive that the short period for which our militia are called out can really make them efficient soldiers. It may be very well for a march past, or for a review, but to perform the duties of soldiers in the field, they ought to be out for a very much longer period, and that if they could be brigaded together long enough to receive

some useful military instruction, it would be advantageous—I mean instruction with regard to field fortifications, and things of that sort. Also, with regard to the Staff College, it appears to me that that was a very desirable suggestion, that the Staff College should be open to them, because I believe there are some men who go into the militia who really have military genius and taste for those pursuits, and it is a great pity that they should not have the opportunity of studying just as well as officers of the regular Army.

Captain HOZIER, 3rd Drag. Gds.: Although I have not one-fourth the experience of the gentlemen who have already spoken, I trust I may claim the privilege which is accorded to every new member in every House, to say a few words upon this subject. There are many points in Colonel Malet's paper which must strike everybody. The redistribution of the country into new districts, the formation of divisions, the placing of head-quarters at important railway junctions, are all points which I think must attract universal attention. He speaks of our "Reserve forces," and in those forces he would include the Militia, the Volunteers, and, I presume, the enrolled Pensioners. Now, it appears to me none of these forces are "Reserve forces" in the real sense of the word. They are subsidiary forces, or auxiliary forces. They are forces which can be called out for garrison duty in the United Kingdom, but legally they cannot be called upon to recruit the ranks of the regular Army. They are not forces which can go anywhere and do anything as "Reserve forces" ought to do. They answer in the Prussian and French systems to the Landsturm and the Guarde Nationale Mobile. Our "Reserve forces," as was stated in the House of Commons, are 2,000 men Army Reserve, and 3,000 men for Militia Reserve, so that we have 5,000 men to fill up the vacancies in 61 battalions of 560 men each. Now the war strength of these battalions is 1,200 men, so that in fact we should require a force of 50,000 men for the infantry alone, in order to bring them up to a war footing. Then we have no Reserve force for Artillery, no Reserve force for Cavalry, no Reserve force for Engineers; in fact we might almost practically say we have no "Reserve forces" at all. You may say the Yeomanry and the enrolled Pensioners would be excellent troops for the defence of the country, but then they are of no service if you have to go into offensive war, and it appears to me that if the country is deprived of the sword, the shield is of very little use to it. The danger of invasion is not so great as it was in the early part of this century, when the greatest military genius Europe had ever known, was attempting to carry out such an enterprize, but there is this danger to which we are exposed: I believe if a squadron of French or American vessels was able to chase our fleet off the seas, to lay off the Scilly Islands and intercept our commerce, there would be such a panic in England, the funds would fall in London, the dividends would be stopped, and the country would be driven into making peace before the enemy would have landed on our shores. If we want a "Reserve Force," we must have a Reserve force which will be able to defend London if possible at the barriers of Paris, supposing France to be our foe. But we have enemies equally dangerous with France, although France has always been looked upon as the natural invader of this country, and even if we were to repulse that invasion, what good would it be to us if we were not able to pursue the enemy? What good is a battle won if the pursuit is not carried on? And if we could not throw an Army into his country and threaten his capital, what use would our defence be to us? Unless we can do so we shall have no success in war; we shall no longer be feared, and shall have no voice in the affairs of Europe. In order to do this, we must have an efficient "Reserve force" which shall fill up the ranks of the regular Army, and enable us to send a powerful force to Berlin, to Paris, to Constantinople, or to Vienna, as may be necessary. To find such a "Reserve force" I believe is one of the most difficult problems that has ever been put before any military department. In foreign countries there is the conscription, and a man after entering the regular Army is naturally anxious to go into the Reserve. In this country a man goes voluntarily into the regular Army, and if he prefers that to all other professions, he remains in it. The question has been raised by General Peel as to the Militia Reserve. This is a subject on which I have no right to express any opinion, I can only trust that Parliament and the Secretary of State for War will find some way of forming a Reserve which will fill up the regular Army so as to enable us to have a powerful offensive weapon.

Colonel MALET: I and my friend who has just spoken, I think, are perfectly agreed. You recollect that at the commencement of the paper I said our Reserve forces are what we dignify by the name of "Reserve forces," though I do not consider them "Reserve forces" at all. I think there is a bad element which we may have to make the best of at a given moment, but I do not think it is at all the weapon which ought to be in the hands of England, or the sort of thing we require for the defence of this country, because I wish this country to be defended, as it has been hitherto, not at home, but abroad, and I hope that will always be the case. Above all, what I think we require is that the time of service should be shorter in duration than it is at present, first in a regiment of the line, and then in the Reserve. But until reason or misfortune shall convince the country that a great reform is necessary, my only object is, as far as I can, to indicate a method of dealing with our present Reserves, limited and bad as I fear they now are.

Major GORDON IVES: I think Colonel Malet began his paper by saying the conscription is the only way of recruiting the Army and forming a proper Reserve. In this I cannot altogether agree with him, although undoubtedly it would be the best. Failing that, he commences by trying to utilize the forces which at present exist, and the whole of his paper might be taken as pointing out a method of organizing the only kind of force which we can organize under the present system, short of a conscription or ballot. The first gentleman who commented on the paper preferred the ballot to the conscription. I humbly differ from him. The ballot is merely a means by which exemption from service may be purchased by money. The moment you are able to buy off your service in the Army, you make it a question of money, and the moment you make it a question of money, you set class against class. Now a conscription takes all classes. By a conscription you may have every young man in England. You may take so many, and you leave the rest, but at least you make no distinction of class, and you therefore can cause no discontent in one class over another class. The 1,200,000 men whom the French nation now support by the new French Bill is a conscription, and not a ballot, and by that conscription they take in all classes. No man is exempt from serving now in some form in the French Army, and, therefore, all classes being taken in, the whole nation is more or less content. A man who is born a labourer cannot say "I am torn from my family to serve my country because I am poor and unable to defend myself," because his near neighbour, who is wealthy, is in the same book as himself, and is obliged to serve in the Reserve Army. One gentleman, who has just spoken, has said that the only possible chance of defending England is to be able to send an invading army abroad. No doubt the best defence we could possibly have in England would be 200,000 men such as England now possesses in her regular Army, the finest troops in the world, and a Reserve of 400,000 men to back them of the same calibre—in fact, an Army of 600,000 men ready to take the field at any moment. But those are things the country cannot support. We are now tremendously taxed, and we have not to deal with what we should like to do, but with what we can do. If we could annihilate the whole British system of military service, if we could say, "We will have a system of 200,000 regular troops as they exist now, the finest troops on earth," if we could do that, regardless of all expense, and also have a Reserve of 400,000 men, drawn from the finest young men in England, ready to take their places, we could then immediately on a declaration of war send 100,000 men here, and 100,000 men there, and we could fight the world, as we have done before, and as I have no doubt we should have no great difficulty in doing again. But that would be a greater strain than we could possibly put upon this country; and what we have to consider is not what we would adopt if we could, but what we can adopt under existing circumstances, what the nation will stand, and what the common sense of the people is ready to adopt. What we have to consider is—we have got our country, and we have got to defend it. If it is assumed that it is impossible our country can ever be invaded, why should we trouble ourselves? But we begin our argument by assuming that it can be invaded, and not only can be invaded, but can be invaded by such a force as to endanger the very safety of the country itself; that our arsenals might be taken, and we might find the very heart

of our empire, and London itself, taken before we could turn round, and so our very centre paralysed, our pulse stopped before we had time to organize the forces that exist. The paper is therefore directed to the object of organizing the forces that we have thought it necessary to have for the defence of the country. We have our standing Army, we have our Militia, we have our Volunteers, and our Yeomanry. All those forces either mean something or nothing. They are either useless, and an absolutely absurd expenditure, or they are an Army which in case of war might be called upon to defend the country. They are its very life, or they are nothing. A Volunteer is either a man who can be called upon to defend his home and his hearth, or he is an absurdity—he is something ridiculous. Then, what is a Militiaman? What is a Militiaman in the best sense in which you can take him? He is a man who may be called upon to be a soldier, to stand up for life or death for his country. I myself humbly suggest that he is a very inefficient soldier, because he cannot shoot, and, as at present organized, though they are often very well commanded, they are occasionally very badly commanded. However, that is not to the point. We have our Militia, our Volunteers, and our Yeomanry, and those men are the forces which at this moment the country supposes will be able to defend it from any invader. We begin by supposing that an invasion is possible, and an invasion of sufficient strength to take the country, and those are the forces which we have to organize, and Colonel Malet's paper begins by assuming that a conscription, if it were possible, is the best and the only means of really forming an Army with which every man might say, "I am satisfied." As I have already said, I do not agree with him. But a conscription on such a large scale as that, Colonel Malet supposes to be, for the present, impossible, and therefore he goes on to organize the forces as they at present exist. Whether those forces are efficient or inefficient, even in a state of perfect organization, is for the senior Officers of the country to judge, and for the Parliament of the country to judge on the advice of the military advisers of Parliament, whether those forces are sufficient when they are properly organized. But at the present moment everybody in the world knows that they are not properly organized—that they are not organized in the proper manner—that they are not organized at all—that they are simply disconnected masses all over the country without any organization whatever. Take the regular Army itself. War being declared, you would have recruits joining the Army, and supposing a battalion of the regular Army to be 500 men, within a month after the declaration of war that battalion would be raised to 800 men. Now, in the present day of shooting, it would be impossible to teach them to shoot, and when we know the tremendous strain there is in time of war on a single battalion without a proper Reserve, will anybody tell me how it is possible to get recruits who will be able to learn their duty? Because the duty of a soldier in the present day is not merely drilling, but shooting, for that is the essential part of warfare. Moving great masses of men, with decision and with rapidity, and enabling each individual man to shoot straight, are the two things we must never forget. Formerly a man might very soon learn to shoot with his battalion, but now individual shooting is a main element, and therefore I beg to say, simply as a Volunteer, that the Volunteers stand pre-eminent in their shooting, and that subject ought not to be forgotten in the question of the organization of the Army. At present, this force is armed with weapons known to be obsolete. In conclusion, I would simply suggest that in considering the pamphlet we have heard read, we ought not to forget that it does not suggest anything new, but is simply put forward as a means for organizing the force, which has been stated lately by our Secretary of State for War, Mr. Cardwell, to be perfectly satisfactory as a defence of the country, but which at the present moment is utterly disorganized, and Colonel Malet's paper suggests one means for organizing the forces as they at present exist.

Captain COLOMB, R.M.A.: We are very apt, when we talk about the defence of the country, to forget the defence of the Empire. The country can be ruined in two ways; one is by assault, and the other is by investment. The gentleman who has just spoken has alluded to the danger of investment with regard to the Channel, and it is quite sufficient for us to remember that investment is a danger. I repeat what I have before stated, that we should, by an enemy placing a naval

force superior to our own in the Channel, suffer with respect to our commerce at the rate of forty-four and a half millions of money per month. That is a thing which we must pay attention to, but it has nothing to do with the paper before us.

As I take it, the regular troops are for the defence of the Empire; that means for the defence of India, and for the defence of our Colonies, I should say, the indirect defence of our Colonies. Our regular troops are for that purpose, for the Navy is powerless without them. But having provided for that, we must also look to the defence of the citadel of the Empire—the British Islands; and whatever means are devised, or whatever schemes are put forth for rendering the soil of the British Islands secure, deserve the attention of every man interested in the defence of the country, therefore, I should like to make a very few remarks with reference to the paper before us.

First of all, the gentleman who spoke second put a very practical question for the consideration of those present—What we shall be expected to do in case of war?—I only speak with regard to the United Kingdom—and he very properly reminded us that we were liable to attack from several quarters, and of that there can be no question or manner of doubt, for this reason, that a number of small squadrons coming out of European ports are far more likely to elude the vigilance of our Channel fleet than a very large expedition. Therefore, in any scheme for the organization of our forces with the view of resisting invasion, we must bear in mind that not only have we to guard against a determined and violent attack upon some part of the coast, but we must also be prepared to guard against simultaneous assaults on detached points.

With regard to the paper before us, the first thing that struck me was with reference to the French occupation of Egypt. That is a question which is not directly concerned in the defence of the country: it is a question for the defence of the empire, and, therefore, comes very properly under the head of the organization of our regular forces. The colonies "screaming for reinforcements," which no doubt they would do, appears to me also to be more a question concerning our regular forces, because the mere invasion of England would not cause that circumstance to occur; it would be more the result of that other way of ruining the country by partial or complete investment, that is, cutting our lines of communication.

With reference to dividing the districts of England, there is a definite object in view, the power of moving organized masses of troops upon the assailable coast line. I am sure we all must agree that it is very good, for that is, after all, what our "Reserve forces" are for, if they are for anything; it is to assemble in properly organized masses regularly and quickly upon any part of the coast line that may be threatened. With regard to the details of that distribution, of course everybody has their own plan, and, therefore, I disagree with regard to the details; but with regard to the principle, I am sure everybody must agree who has really thought out the subject.

Now, there is one point in the paper which I wish to make a very few remarks about, "that regular troops cannot be localized." I may be permitted to say, as I belong to a "localized service" myself, that I disagree with Colonel Malet. I belong to a service which has its fixed head-quarters, whence its men are sent out to all parts of the globe in detachments numbering from 5 to 200 on short notice, perhaps in a few hours, with a complete organization. They return to their fixed head-quarters, their wives and families keep up their local connection with the place, and in every way, as far as my experience of fifteen years goes, it is an entirely satisfactory process. And I believe it is the true principle to be followed out with regard to Army reform, for this reason, that if you get a short service Army, which we are coming to, and must come to, the local connections of men must be preserved; as soon as a man gets his discharge from the Army he settles down again into civil life, he distributes himself, as it were, and, therefore, the more you can localize the Army, the more sure are you of a man being ready to take up his old place and his old post at the head-quarters of the district to which he belongs. Therefore, I believe "localization" possible, and indeed, Colonel Malet, I think, will remember that, to a certain extent the service to which he belongs is "localized." It has its battalions abroad, and it has its battalions at home,

within a certain district, and, therefore, I must be allowed to express my idea that "localization" of troops is possible, and not only possible, but I believe it to be the true principle which will ultimately be followed out.

There is another point—and a very important one it is—with reference to the distribution of artillery and infantry, and I think Colonel Malet has pointed out what has always struck me as a very—I hardly know exactly how to express it—but as a very grave defect in the "Reserve forces," namely, that you have garrison artillery where you do not want them, and you have infantry where you do not want them. To make this evident, I will just go back to explain what I mean by referring to the question which one of the speakers asked, "What shall we be called upon to do in case of war?" Now, I am only speaking with regard to the defence of England. We should be called upon to hold certain fortified positions, Woolwich, Chatham, Dover, Portsmouth, Plymouth, Pembroke, and so on. Those are immense fortified arsenals, upon which the safety of our fleet depends, and not only that, but the safety of the country, for they may be the basis of operations for our Army. I note the constitution of the "Reserve forces" surrounding these fortified points, and what do I find? I find a small proportion of garrison artillery, and a very large proportion of infantry; in other parts of England, where there are no fortifications at all, I find garrison artillery, and so on. Therefore, that point in the paper is, to my mind, a very important one, and I believe that, with reference to the fixed and fortified points, the true policy is to convert the whole of the surrounding districts into garrison artillery, with their head-quarters at the fortified point.

With regard to field artillery, my own impression is, as an artilleryman, that there is no hope of ever having an efficient field artillery of the "Reserve forces," and, therefore, I believe that the true policy of the country is to keep up her field artillery to a strength not merely in proportion to the line of our regular troops, but equal to the line of those regular troops and their reserves, whatever they may be.

With regard to re-numbering and telling off Volunteers by brigades and districts, I know by experience, from having been employed on one or two Volunteer reviews, particularly with regard to the garrison brigades of Volunteer artillery, that there is nothing more prejudicial to system, and there is nothing more likely to give rise to confusion than the defect pointed out in that paper, and that is not having them numbered according to their position in the brigade and division to which they belong.

And having made these remarks I wish to say, I think with reference to the distribution of troops in the United Kingdom, that we are all bound to come back in point of fact to the original question, what will we have to do with our "Reserve forces" as they are, not as they may be, because we may have war before we have time to organize anything else. But, whatever forces we have, we must bear this in mind—we do not know when we may have war, and we must know that these forces are for war and nothing else, and therefore any scheme that can bring before us a practical plan by which the exigencies of war can be met by our war forces deserves consideration, and I am sure a great number of points in the paper which has been read this evening, and which I have mentioned, deserve very serious consideration.

Lieutenant-Colonel LEAHY, R.E.: Much that I had to say upon this subject has been anticipated by Captain Hozier, who has pointed out what our "Reserve forces" should be. I only wish to add that I believe the great defect of our military system has been the system of re-engagement and long service. It was not the original intention and constitution of the British Army that the service of the soldier should be long—in fact we all know that soldiers were only originally enlisted for a campaign. It was only at the beginning of the last century that the field artillery was organized on a permanent footing, and this is the force that requires the longest training, and, as has been most justly observed to-night, the force that ought to be kept up permanently on the largest scale. I believe the true remedy for insufficiency of "Reserves" is that pointed out by Lord Grey before the Recruiting Commission, and I cannot understand why that Commission did not notice the important evidence that he gave before it. He suggested enlistment for a short period of service, with liability to serve afterwards in a "Reserve force." That is the

true principle of a "Reserve force" for supplying the men required to fill up the ranks of the regular Army. This principle also ought to be applied to our Militia—a large proportion of our Militia are now re-engaged men, which is a great mistake. Our great object ought to be to have as many men in the country as possible who have had a military training. I fully concur in what one gentleman stated, that rifle shooting is such an important part of our military instruction that the Volunteers, or any organization which will encourage instruction in shooting as a part of the civilian's education, will tend to increase our military strength. Much has been said in the abuse of Mr. Cole and his "Parliament," but I think there is much force in what he says, namely, "that he would wish to see as large a proportion of the people as possible receive some military training, and he would begin it at school." We know that there are Volunteer corps at some of our public schools which have attained considerable efficiency, and I do not see why the system should not be extended throughout the whole country. If it were so, our military force would probably require a shorter period of training, and taking economy into question, the shorter the time they are under instruction, the better.

I do not believe this country will ever listen to the word "conscription;" we must depend upon a Volunteer Army, however it be raised. Considered economically, the question is this—We have four classes of forces. *First*, the Volunteer, who costs the country a very small sum per annum, not more than a Swiss soldier, about from £1 10*s.* to £1 14*s.* a year. The larger number of these we have the better, their moral influence is very great. Then come the Militiamen, who cost perhaps *four* times as much as the Volunteers—in my mind too much, in consequence of the expensive staff that is kept up for their instruction. I do not at all see why having, as we have, a large proportion of Officers in the regular Army, a certain number of them should not be lent for teaching the Militia. The Militia Staff, consisting of about 5,000 men, costs more than the Militia who are trained—some 70,000 or 80,000. I should like to see less spent on the permanent staff and more on the training. The next force we have is the "Army Reserve" soldier, who costs more than the Militiaman does, and it is a class that ought to be in every way encouraged. Then you come to the regular soldier, who costs about four or five times what the "Army Reserve" soldier costs, and from 20 to 25 times what the Volunteer costs. They ought to be as few and as perfect as possible, looking for support to the men in the "Reserve" force.

The matter may further be looked at from this light. We now enlist from 15,000 to 20,000 recruits a year. If a shorter period of service was instituted, and service for the colonies and India was made a separate engagement, we should only require from 7,000 to 8,000 to keep up the Colonial and Indian Army. Upon examination of the statistics before the Recruiting Commission, it appears to me there are about 12,000 "loafers" in the country who are always glad to enlist as soldiers, and make the Army their profession. Now we have to go beyond that number, and give bounty to induce some 3,000 or 4,000 men in addition to join. If we had separate engagements for colonial service in place of having to give a premium to add to the number of men who are naturally willing to join the Army, we ought to send away some 4,000 or 5,000 of them, and those men would be only too glad to serve in a "Reserve force." I therefore think that short service is the remedy for insufficient Reserves, and I have not the slightest doubt but that it could be carried out without any great disturbance of existing arrangements.

With regard to fixing the districts of the country with reference to railway communication, that is a subject brought before a meeting of this Institution last year. I then recommended a plan, giving the details, on the principle that our military districts ought to be based with reference to our railway communications. In a matter of detail I think Colonel Malet has made one mistake. In his Western District he includes places to which the broad gauge does not extend. I made it a little different, in order to keep the broad gauge lines in one district and the narrow gauge in another, but the principle is right.

Colonel MALET: Lieutenant-Colonel Leahy is probably not aware that the Great Western Railway are now adopting the narrow gauge.

The CHAIRMAN: The two gentlemen who last addressed the meeting are well

entitled to be heard before it, for both these gallant Officers read most useful papers, remarkable for their ability, in this Institution, Captain Colomb this year, and Lieutenant-Colonel Leahy last year. The one is already published in our Journal, the other will shortly be published, and I do not hesitate to say both of them are valuable contributions to the literature of this Society, as well as a general benefit to the country. My hon. and gallant friend, Colonel Malet, may at least be assured of this—that he has produced a paper here to-night which is able in itself and has the merit of having given rise to a most interesting discussion. He has raised the point, though perhaps not going into the whole question, of what should be the defensive resources of the country, both with regard to its internal as well as its external defence, and there are points in it, which this meeting has already recognized by the speeches we have heard, as well worth the consideration of the country.

Captain Hosier, I think, hit the nail on the head first when he pointed out the difference that existed between the "Reserve forces" for the defence of the country, and the "Reserve forces" as a supplement to the Army. There are, no doubt, two kinds of "Reserve forces." We have first the Militia "Army Reserve," as they have been called, and secondly the Volunteers. But we most undoubtedly have no "Reserve force" at the present moment by which we can supplement the line in the case of taking the field. It is now settled that every regiment at home is to be of the strength of 560 men. If war was declared those regiments would have to be filled up to at least 900 or 1,000 men, and where are we to get the men to fill them up? That is the question which this country has now to solve; that is the question which the Secretary of State for War is now engaged, and his predecessor was engaged in considering. It is a most difficult question. It is very easy to prepare a paper about the advantage of short service, but when you come to consider the question of how you are to get these 30,000, 40,000, or 50,000 men, to have two "Reserves," namely one "Reserve" to put into the regiments to make them up 900 or 1,000 strong, and another "Reserve" to supply those vacancies which must immediately fall upon regiments after they have taken the field, not only by casualty in action, but by what is much worse than the mortality that occurs in action, namely, sickness in the field; you therefore require not only 30,000 men to put in the Army, but you must have another 30,000 men ready to take their place when the regiments that go out first, fall short of their numbers. With regard to the "Reserve Forces" for the defence of the country, it is perfectly true that there is no organization. These forces have been raised at different times; they rest upon different Acts of Parliament, and at the present moment there is no machinery existing by which these forces can be brought together. The Militia at the present moment cannot be put under the command of General Officers of the districts. The Volunteers you have no power over. They go out when they please, and no authority either from myself as the Chief of the "Reserve Forces," or from the General Officer of the district, can bring them out. Now it will be a grave question by-and-bye whether there should not be terms made with them by which upon certain occasions they shall be bound to assemble and place themselves in the hands of the Commanding General Officers of districts. However, at the present moment it is the case that those forces have no cohesion, and the law as it at present stands, will not allow of their being brought together. As to what may be the eventual mode of doing it, I do not know, but I hope in course of time we may find means to so far organize these forces that they may be not only available in time of war, for then they are certainly much more available, because an Order in Council can place them at once under the Mutiny Act, but that we may make preparations for war in a time of peace, by having the power to assemble and to instruct these troops.

Some remarks were made with regard to the Militia. It so happened that, last year, I inspected a great number of regiments of Militia, and I can only say this, I found them in most admirable order. It is perfectly true they did not go far enough. I inspected some regiments that, as far as machinery and drill went, astonished me; but I said to them, "I am very much pleased at what I have seen, but I have not seen as much as I should like. You cannot do this, you cannot do that, and, therefore, I do not consider you have done as much as you ought to do." I trust we shall make a little advance this year. Amongst other things, rifle prac-

tice has been alluded to, and there is no reason why the Militia should not go through a course of rifle practice. It has been unfortunately left in previous years to Commanding Officers to do as they pleased with regard to it. This year we shall get some Sniders into the hands of the Militia, and in another year I hope they will all be armed with that weapon. I fondly expected this year that the whole force of Militia would have been armed with them, and that we should have been able to carry out a regular system of rifle practice with Sniders in their hands. However, that cannot be; but it is essential that Militiamen should be taught to fire, and taught under a regular system, a system as complete in its operation as that of the regular Army; that they should be well looked after, and the results of their practice published in the same way as the records of target practice are published now. I believe we shall be able to accomplish that, and I fully believe that, efficient as that force is as far as it goes, and it is wonderful that they are so efficient, we shall make them still more so than we have already found them.

Now, with regard to the Army service. We must come to this, that if you have a short service, you must say that you will not allow a man to re-engage. It is a difficult thing to say that; it is a difficult thing to say to a man who likes the Army that you won't allow him to go on; and we have not, I believe, ever got to establish such a principle as that: but the fact is, at the present moment—it may astonish some people out of doors—I do not hesitate to declare that the Army is essentially a popular service in the country. There is not only no difficulty whatever in getting men, but they re-engage by wholesale. For instance, men are allowed to re-engage after they have served six years and a half now, and hereafter it will be eight years when we get the twelve years enlistment into operation. The men do not take their discharge, but they re-engage; they re-engage three or four years beforehand for a term of nine years afterwards. The pension, no doubt, is a considerable object. The consequence of that is, that if we had a short service, and allowed re-engagement, the men would not go to the "Reserve," they would stay with their own regiments. Those that like the army would stay with their own regiments, and those who were tired of the Army will not go into the "Reserve." We offer good terms at the present moment. We offer men who have taken their discharge at the end of ten years, and men now serving who are in excess of the English establishment, who have completed six years and a half, to take them for a further three years and a half, and join the first "Army Reserve." Those who have taken their discharge we invite to enter the "Army Reserve," where they will get £4 a year, and only have to come out for twelve days. But they won't take it. Things may alter they say. The soldier, we all know, is a shrewd and a remarkably suspicious man; he is never quite sure what is to be the operation of the next change; and there may be something in that. Possibly, in a year or two they may see the advantage—or their wives may for them—of having £4 a year upon the bare chance of being called upon to take the field in the event of there being a war; and as we know this country will not very easily engage in war, and must be driven into war before it will embark therein, it is evident that the men are almost perfectly safe to get £4 a year for doing very little.

Then, with regard to districts, I cannot exactly express any opinion upon the actual *corps d'armée* districts which I see before me, but there is no doubt whatever the districts of this country will have to be altered. If you take the Northern District you find that it is a gigantic one. I am afraid to say exactly what is the number of troops altogether in the Northern District, but I rather think it is upwards of 100,000, including all branches. It is evidently far beyond the power of any one man to fulfil the duties of that situation if the "Reserve forces" of a district are all to be placed under the command of one General Officer, as ought to be the case. Then, in the Midland counties there are no regular troops, but there are vast numbers of Volunteers; and, as the gallant Officer said just now, there are riflemen where they are not wanted, and artillerymen should be, where they are not. Unfortunately, when that force was first formed, they were allowed to select what they would like to be; nobody seemed at all to regulate how the force was to be distributed, or what their particular duties were; and although, looking at the whole force, the larger quantity of artillery are to be found in maritime counties, yet, at the same

time, artillery is to be found where artillery would never be wanted: at any rate, if they were, they would have to be removed from the counties in which they are now situated.

"Field Artillery Reserve forces" were mentioned. I do not hesitate to express my opinion against "Field Artillery Reserves," and for this reason. We all know in the Royal Artillery that it takes three years to make a good driver. I do not mean to say by that it would take three years to make an ordinary driver—probably you may do it in much less time; but still a good driver is essential for field artillery. The gunner can be taught field artillery drill, to a certain extent, without taking the battery into the field; but the Officer who commands the battery, the non-commissioned officers who are attached to the battery, the driver and the horses—no small element—but, however, the driver in particular cannot be properly trained in the Volunteer or Militia services. Let the guns be prepared; let Woolwich be full of guns; let all the gunners, whether in the Artillery, the Volunteers, or the Militia, be taught field artillery as far as the drill part is concerned; and then we may attach them to the Royal Artillery, and they will be found in a very short time capable of doing the work of gunners in the field; but the drivers are a great branch of the profession who must be taught; and if you are suddenly obliged to take the field, you cannot find drivers as fast as you want them.

The Staff was alluded to, and that is an important point in the organization of our "Reserve forces." I do not go so far as to say "open the Staff College," because I think the class of Officers who belong to the Militia and the Volunteers would not be able to go through what is usually termed the "Staff College course;" but what I should like to see is this: I should like to see a Staff School established at the Staff College; I should like to see regimental schools established in regiments of the line in different parts of the country, not absolutely to force the Volunteer Officers to attend them, because it is hardly possible to expect them to leave their occupations entirely, but at any rate, you should give the opportunity to the Volunteer Officers and Militia Officers to attend these classes, in order to qualify themselves for their position in the Reserve forces. I would do the same thing with the Officers commanding regiments, particularly the Volunteers, because many Officers command regiments in the Volunteers who have no other qualification whatever than their social position. I would even go so far as to say this: I should like to see future Commanding Officers obliged to go to the Staff School in order to obtain to position of command. I would establish such schools at Aldershot and Sandhurst, where they might learn to manage battalions and brigades. If we do organize the force in brigades, which is perfectly possible, not perhaps at the present moment, but by-and-bye, it is essential that they should know how to command, and I cannot see how a man is to command a brigade in the field, who has never commanded a battalion. As a general rule, you will find the troops are massed in the south of England; those are the important points as far as the historical feelings of the country with regard to invasion are concerned. The force is small, but railways give us the power of concentrating our troops wherever they may be wanted.

Having said thus much, I need only say further, that I am sure you will all agree with me in passing a vote of thanks to Colonel Malet for having written this paper, and to Sir Alexander Malet for reading it; and I think that this discussion will be most beneficial to the object Colonel Malet had in view, when he wrote that paper.

Evening Meeting.

Monday, April 5th, 1869.

ADMIRAL SIR HENRY J. CODRINGTON, K.C.B., in the Chair.

NAMES of MEMBERS who joined the Institution between the 22nd March and the 5th April, 1869.

LIFE.

Watts, J. S., Navigating-Lieut. R.N. 9*l.*
Mills, Richard, Capt. Civil Service Rifle Vols. 6*l.*

ANNUAL.

Jenner, Stephen W., Lieut. Roy. Engrs. 1*l.*
Laurence-Archer, J. H., Capt. (h.-p.) 4th W. I. Regt.
Mist, Henry W., Captain Roy. Engrs. 1*l.*
Sexton, M. S., Captain Roy. Art. 1*l.*
Grant, W. B., Captain R.N. 1*l.*
Russell, C. R. T., Lieutenant R.N. 1*l.*
Gimson, Herbert, Navigating-Lieut. R.N. 1*l.*
Currie, James P., Major Civil Service Rifle Vols. 1*l.*
Jerome, John, Major 86th Regt.
Walker, W. L., Lieut.-Colonel (ret.) Indian Army. 1*l.*
Hime, F., Captain Roy. Engrs. 1*l.*
Allen, George W., Lieut. R.N. 1*l.*
Kemp, F. R. B., Lieut. R.N. 1*l.*
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THE CONVERSION OF OUR SCREW LINE-OF-BATTLE SHIPS INTO ARMOURED TURRET SHIPS.

By CHARLES F. HENWOOD, Esq., Naval Architect.

IT will, I think, be generally admitted that our unarmoured screw line-of-battle ships, are for actual warfare valueless; but is it certain that they cannot undergo such modifications as will, at a moderate cost render them extremely valuable? My object this evening is, to prove to you that many of them can, and that great economy would thereby result in our naval expenditure.

The Secretary to the Admiralty, in March, 1867, stated in Parliament, that there were 55 ships of the line, the value of which including those in commission was about £8,250,000; and the annual cost of merely keeping them in a proper state of repair, £117,260.

The question, therefore, also involves the utilization or sacrifice of this large amount of valuable public property.

It may not be out of place briefly to glance at what has been already done, in the way of converting screw-ships of the line into ironclads.

In the year 1860, there were about 12 screw-ships of the line laid down of the "Duncan" class—

LINE-of-Battle Ships of the "Duncan" class already converted into iron-clads on the broadside and box principle.

Name.	Length.	Tonnage.	H.P.	When converted.
	Ft.			
Ocean	273	4047	1000	1863
Caledonia	273	4125	1000	1862
Prince Consort	273	4045	1000	1862
Royal Oak	273	4056	800	1862
Royal Alfred	273	4068	800	1864
Zealous	252	3716	800	1864
Repulse	252	3749	800	1868

Total first cost of the above seven ships, £1,688,408.

Of these the "Ocean," "Caledonia," "Royal Oak," and "Prince Consort" (See Diagram No. 3) were converted into iron-clads, wholly protected, on the broadside principle—the "Royal Alfred," "Zealous," and "Repulse" into iron-clads, partially protected on the "box-principle." The only screw-ship of the line converted as yet into a turret ship, is the "Royal Sovereign," which is universally considered a very formidable vessel of war. Satisfactory opinions have also been expressed with regard to the fighting powers of the converted screw ships of the line on the broadside principle. Admiral Yelverton reports, November, 1866, of the "Ocean" and "Caledonia," as follows:—

"As serviceable and cheap iron-clads for line-of-battle, and hard "fighting in a moderate sea, my experience leads me to the conclusion, "that they are most efficient ships of war. In steaming full-speed, "the 'Bellerophon,' 'Caledonia,' and 'Ocean' were nearly alike.

"I do not hesitate for a moment in recommending, that the number "of this class of vessel be *doubled*, by the conversion of some more "of the now useless line-of-battle ships into vessels of this descrip-"tion."

The following extract from an account of the voyage of the "Ocean" from the Mediterranean to China (taken from the "United Service Gazette" of September and December, 1867), fully confirms the good opinion formed of her by Admiral Yelverton; and as it will reply to many objections which have been urged against this conversion scheme, it will not, I hope, be considered out of place, nor prove uninteresting:—

"The 'Ocean' left Gibraltar on the 17th June, 1867, arriving at "Madeira on the 25th, under easy steam and canvas, winds being very "light—left for St. Vincent on the 28th, doing the entire distance from "Madeira to St. Vincent in seven days under canvas alone, winds very "variable and light—the next day she left for Rio de Janeiro, where "she arrived on the 29th July (under easy steam and canvas, she "averaged 12 knots), beating the 'Dryad' (one of the Amazon class), "which left Madeira 4 hours before the 'Ocean,' by an hour—left "Rio de Janeiro for Singapore on the 10th August, and up to the

"24th encountered nothing but light winds and calms; on the 24th it "commenced to blow fiercely from the north-west, it soon freshened "into a gale, and the sea rose in a manner that would have startled "the Channel Fleet; from the direction and intensity of the wind, it "was supposed to be a pampero from the River Plate, it lasted "48 hours, during which time she ran 445 knots, without getting "the deck wet, under reefed topsails and courses, being as steady and "stiff as a rock, and at the same time as buoyant as a cork,—50 miles "being run in 4 hours in a ship all but jury-rigged,—sailing best when "able to carry all plain sail, to a stiff breeze, when she averages "8 to 9 knots an hour. On 2nd September just rounding the Cape, "it commenced to blow from the south-west, with a high, 'rough and "tumble' sea, the wind lasting 9 hours.

"September 2nd to 8th almost a calm. On the 8th it set in squally "and black, with every prospect of bad weather—things were made "snug just in time for a gale from the south-west, accompanied by a "sea whose waves were estimated from 40 to 60 feet high. The gale "lasted for two days, the ship running as before, and scoring 360 knots "on her way—all hands much pleased at her performance, and almost "wishing it to blow a gale every day, as not being able to set sail "enough, they wanted something like a gale to send them on to "Singapore.

"On the 11th it blew as hard as ever, this tried her to the utmost; "but she behaved admirably, and far better than was ever thought a "ship of her description could in a heavy sea; this lasted for 3 days, "and the 15th was a dead calm; the next day it appeared as if a "cyclone was approaching, and blew so hard, that steam was got up; "the sails having been tried so severely previously; in a few hours it "burst on the ship with a fury that was awful. It was decided "on running at full speed under steam, being impossible to lay to, as "not a rag of canvas could be shown. This was no sooner carried "into effect, than away went the 'Ocean' at a speed never before "attained by any iron-clad of any nation. The sea was blown in tons "over the deck, washing all before it.

"This storm was a trying one for the ship, starting 5 huge beams "out of their scarvings in the engine-room; but not a single armour-"plate started,—a few rivets soon mended the beams, nothing else "being started in the ship.

"The 'Ocean' on this occasion went faster than she had ever done "before, and it is hoped she ever will again; the speed could not have "been far short (in the fiercest gusts) of 16 knots.

"On the 21st the sea moderated, and being able to spread 'all plain "'sail' without fear of the spars being carried away, she ran well, "averaging from 8 to 9 knots, showing what she might do, if pro-"perly rigged, as she ought to be.

"She arrived at Singapore on the 23rd September, having en-"countered such a succession of gales and stormy weather as none of "Her Majesty's ships of late years have had the ill-luck to meet with "on the China passage, and which establishes her character as a "thorough sea boat, and a good 'Ocean Cruizer.'" And in the last

report of the Channel Fleet (1868), page 5, Admiral Warden says, of the "Prince Consort" and "Royal Oak:" "They have good qualities, "they are armoured throughout—are powerful ships, *handy under* "*steam*, from being short, with good speed, and do sufficiently well "under sail."

But the Controller of the Navy remarking on Admiral Yelverton's recommendation, says, "I am of opinion that all converted ships of the "'Caledonia's' class, are inevitably heavy rollers, from the position "of their weights, and I consider *the defect* a sufficient reason for not "adopting Admiral Yelverton's recommendation for doubling the number "of ships of this kind." Also Captain Armitage of the "Prince Consort," in last report of Channel Fleet, considers *the defect* of heavy rolling, too serious to pass over lightly, although "in other respects she is a "serviceable ship, remarkably handy under steam, and stays well."

The Controller of the Navy also objects to conversion after the "'Zealous,' or partially armoured class, leaving wooden unarmoured "extremities fearfully liable to be set on fire by shells, a catas-"trophe which happened to the Italian ship 'Palestro' at the battle "of Lissa.

"Except, therefore, as a makeshift, and only *if nothing better* can "be got, I could not recommend Admiral Yelverton's proposal for "adoption."

Now, these objections are entirely obviated by my plan of conversion.

It will be seen that the weights of the "Caledonia" are very differently disposed to what they would be in the "Duncan" converted (see Diagram, No. 3); the effect on the rolling of the two ships may be illustrated, as follows:—

Take the two sides of the "Caledonia" between A and B at weight of about 700 tons, and in an otherwise similar ship put the 700 tons in the shape of turrets in the centre at C. The distance of the 700 tons, A, B, from the axis of rotation, G, being 28 feet, that of the 700 tons at C being 12 feet, the result therefore in each case would be—

	Tons.	Moment of inertia.
Broadside "Caledonia".....	$700 \times 28^{(2)}$	$= 548{,}800$
Turret „	$700 \times 12^{(2)}$	$= 100{,}800$

thus, in this particular, the broadside "Caledonia" would have more than five times greater tendency to roll than the turret "Caledonia."

The application of this important dynamical law to naval architecture, viz., "that the effects produced by weights in motion are in proportion to the square of the velocity," was first propounded by my father in 1830. And as it has an important bearing also in relation to many of the iron-clads now building (I refer to the *heavy*, lofty armour-plated sponson-batteries on the upper decks of the "Invincible" class, and "Sultan"), a simple demonstration of it may not be uninteresting, and I cannot do better than take it from a lecture by Captain Fishbourne, C.B., R.N.

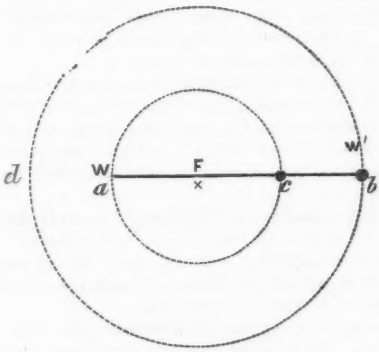
"While remaining at rest, a greater weight at a less distance, will

balance a less weight at a greater distance, but when set in motion the balance no longer obtains, for the weights under this latter circumstance act according to the squares of their respective distances from the axis.

Let W balance W′ on the lever, a b, F being the fulcrum or centre of rotation. The moment W × F a = W′ × F b.

Suppose the lever to make one complete revolution, then velocity of W : velocity W′ : : circle, a c : circle, b d : : F a to F b; the moment (W × F a) × velocity of W = effect of W in motion: and the moment (W × F b) × velocity, W′ = effect of W′ in motion, or momentum of W = W × F a^2,—and momentum of W′ = W′ × F b^2. Hence it appears that the effect of any rotary weight is as its moment × its velocity.

Suppose W placed at c, and



Let W = 14 lbs., F c = 2 ft. W′ = 7 lbs., F b = 4 ft.
Moment W = 14 × 2 = 28 = Moment W′ = 7 × 4 = 28 „
„ of inertia W = 14 × 2 × 2 = 56 ft.
„ „ W′ = 7 × 4 × 4 = 112 „

This law was further proved by experiments made by my father—*the first* being suggested by Professor Main.

Two bars, one 6 feet long, the other 3 feet, were placed on the same axis with weights at their extreme ends, so that either arm of one bar would balance either arm of the other, were they cut in two and joined. The bars were tied together with a single twine, with a bit of hemp moistened with spirits of turpentine between its threads, which was set fire to at the instant of making the bars revolve on the axis. The bars revolved together till the twine was burnt, and from that instant the number of revolutions of each bar was counted; a mean taken of several trials, showed the number of revolutions of the long bar to be to those of the short bar as 3·5 to 1.

Making due allowance for friction, and resistance of the air, and the accelerated motion of the short bar through its being tied to the other,

it is to be concluded that the same moving force produces four times as great effect, or extent of motion in the long bar, as in the short bar.

The second experiment was made with two mauls fitted so as to strike on bolts. Holes were bored with the utmost precision in a block of wood of uniform solidity, and copper bolts cut from the same bar were driven 2 inches each into the block for the experiment. The two mauls used were 13 lbs. each, one fitted to descend by gravity in a circular arc of 3 feet radius, and the other a 6 feet radius. It is well known that a heavy body let fall from a height of 1 foot, acquires a velocity of 8 feet per second; if it descend 4 feet, it acquires a velocity of 16 feet. The object in the experiment was, to make the maul with the 6 feet radius strike the bolt with precisely *twice as great* velocity as the maul with the 3 feet radius; accordingly it was necessary to allow the 6 feet maul to descend from a height of 4 feet, and the 3 feet maul from a height of 1 foot, and then the velocity of the former, at the instant of impact on the bolt, was precisely double the velocity at the instant of impact of the latter.

The result obtained from many such experiments was, that the effect produced by the 6 feet (radius) maul, was more than *four times* that produced by the 3 feet (radius) maul.

Thus by practical experiment was this important law *proved*.

It is therefore clear, that if the "Caledonia," instead of being converted into a broadside iron-clad, had been converted into a turret ship, with a large portion of the weight in the centre, instead of at the broadside, the fault of heavy rolling would certainly have been greatly diminished.

It is also, I think equally clear that the six vessels of the "Invincible" class, and the "Sultan," in respect to the enormous weight of their upper-deck-sponson-batteries, will be very heavy rollers—and this defect in seven new vessels involving an outlay of over £2,000,000 can only be regarded as a very serious error.

The second objection against conversion after the fashion of the "Zealous" on the "Box"-plan, leaving about two-thirds of her length above the main deck unprotected, and liable to be set on fire by shells, as well as the main deck afore and abaft the "Box," is also obviated in the proposed plan of conversion; yet, notwithstanding the objectionable feature of the "Zealous," the "Repulse" has lately been converted as "Zealous," at a cost of about £256,000.

Plan of Conversion.

Cutting Down.—The plans and model* have been prepared from the actual working drawings of Her Majesty's Ship "Duncan," supplied to me by direction of the late Board of Admiralty. No. 1 represents the hull of the "Duncan" as a 90-gun ship, from the water-line up. That portion which it is proposed to remove, consists of the poop, upper, and main-decks, together with the heavy ship's sides and their fittings, as shown also on the section plan, No. 3; this completes the

* The model can be seen in the Museum of the Royal United Service Institution.

Diagram N° 1.

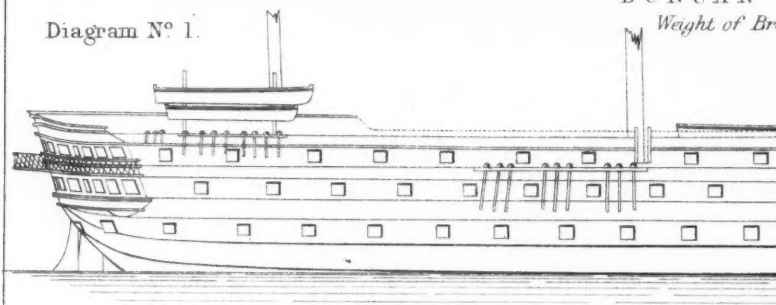


Diagram N° 2.

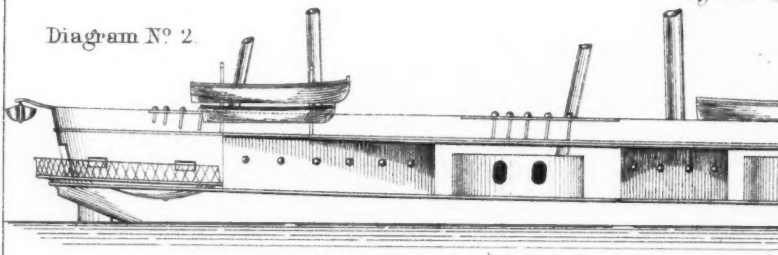
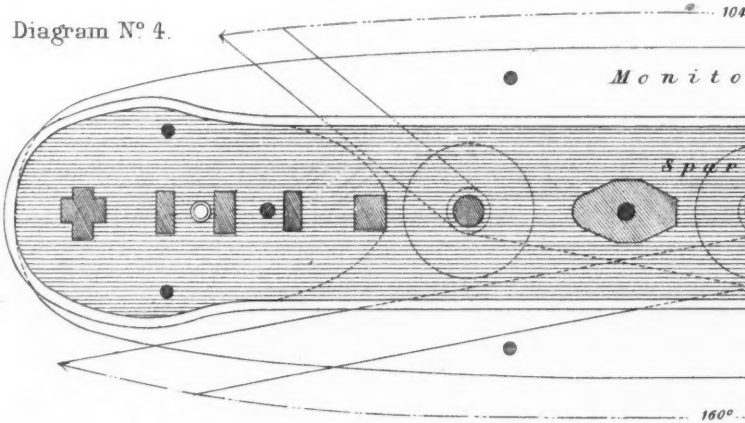
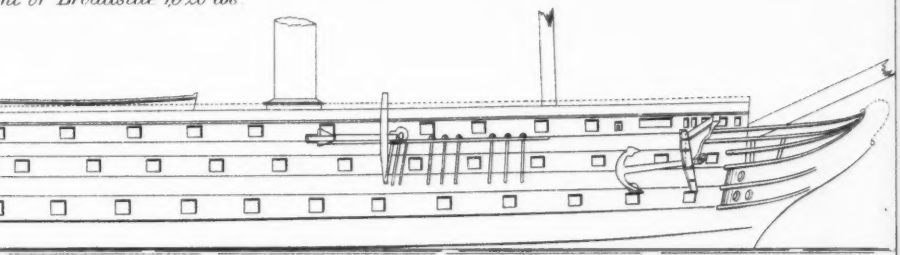


Diagram N° 4.



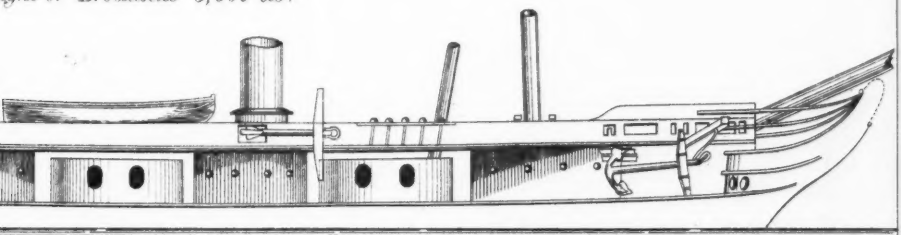
CAN" 90 GUNS.

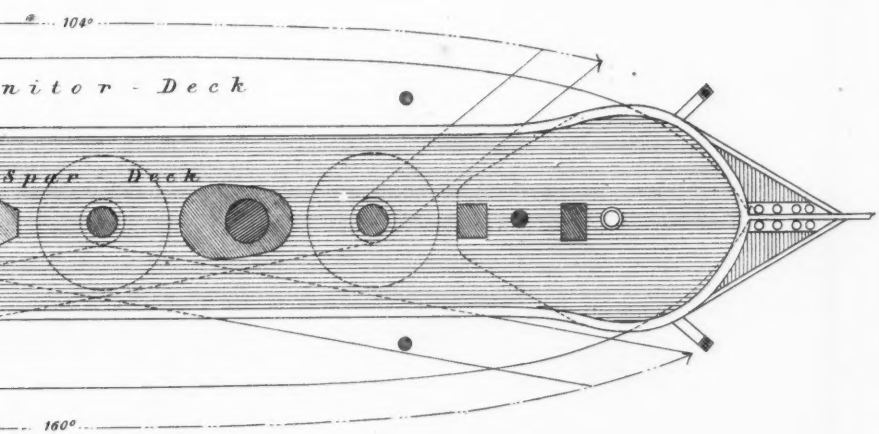
ht of Broadside 1920 lbs.



NCAN" CONVERTED.

ight of Broadside 3,600 lbs.





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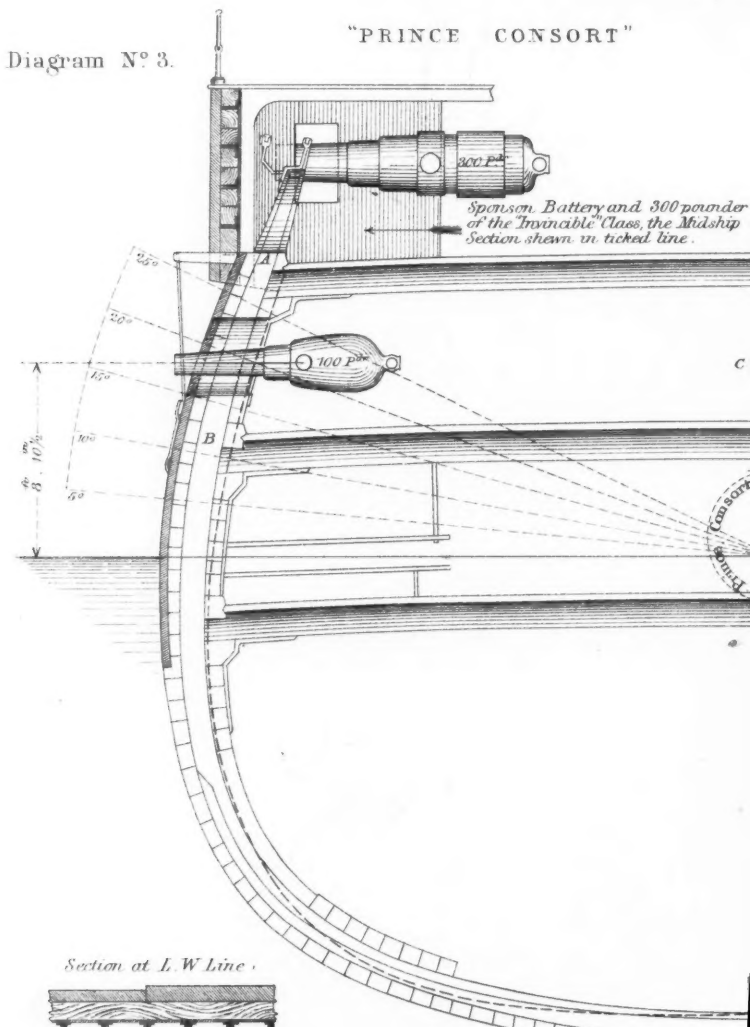
"PRINCE CONSORT"

Diagram N° 3.



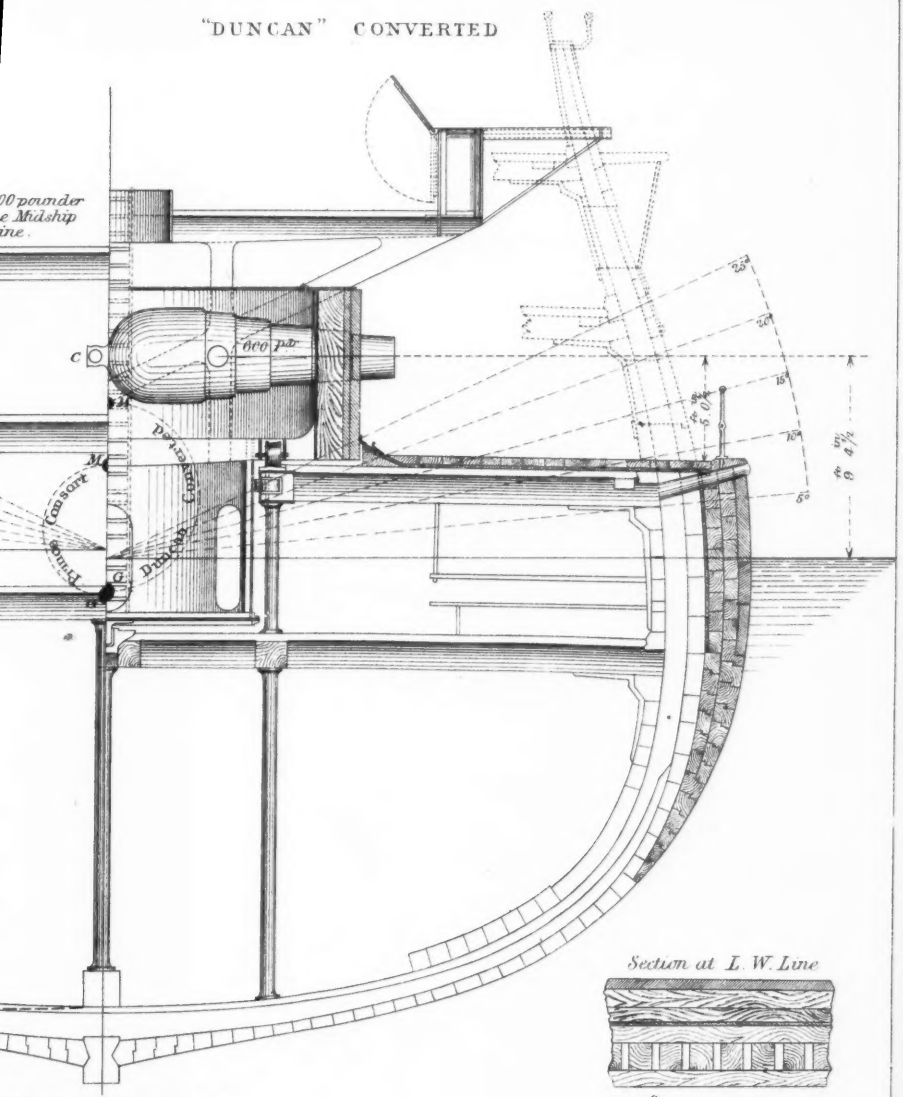
Section at L.W Line.

of "Invincible" Class.

Scale ⅜ of a

SECTIONS

"DUNCAN" CONVERTED



Section at L. W. Line

le ⅛ of an Inch to one Foot

of "Duncan" converted

J. Jobbins

cutting-down process, and leaves but little of the topsides above the gun-deck, those small portions are necessary however to the proposed plan of conversion; the remaining portion of the hull of the ship, which contains the machinery, boilers, coal-bunkers, magazines, store-rooms, and a complete lower-deck for the accommodation of the officers and crew, it is proposed to utilize in the following manner:—

I first cover the deck with 2 thicknesses of ¾-plate, except under poop and forecastle, which is of one thickness, and the sides in way of the armour, with plates 1½ inches thick, the upper plates on the sides being connected to the deck-plating by a strong angle-iron extending all round the ship; the teak backing, and doubling is then brought on, and securely bolted to the hull, a teak deck is also laid over the iron plating on the Monitor deck. It will readily be seen what an enormous increase of strength is thus added to the hull, making it of much greater strength than the "Ocean" class, which have no additional strength given by their plan of conversion. The armour-plates, it is proposed to secure to the teak backing on the French system, and to sheath the armour-plates with teak plank in the usual manner, so as to be coppered, or else sheathed with zinc without the intervention of the teak covering planks.

This completes what may be termed the Monitor, with the exception of the turrets—add the turrets, and we have the complete fighting ship. The forecastle, poop, and spar-deck have now to be added to make her a sea-going Monitor, and to enable her sails and anchors to be worked, without interfering with the firing of the guns from the turrets, and for stowage of boats, &c. (See Diagram No. 2.)

Thus, I submit is fulfilled the requirement of the Board of Admiralty, as stated by their Secretary in July last, viz.:—"They did not want "a turret ship of the 'Miantonomoh' class, but a vessel which would "go to sea, keep at sea, and be able to remain there for weeks."

The spar-deck, fore-part of poop, and the after-part of the forecastle are constructed of iron.

The turrets are plated with armour 6 inches thick—those of the "Royal Sovereign" being plated with armour 5½ inches thick.

It has been said that such converted line-of-battle ships would have weak and exposed stern-posts and rudders, and would be incapable of being used as rams; this, however, is but a theoretical idea, which experience of facts dispels, for Admiral Sir Sidney Dacres, speaking of the "Prince Consort," one of the converted line-of-battle ships, says: "Her rudder is well hidden;" while, on the other hand, Admiral Yelverton says of the "Bellerophon's" rudder, which was designed to be "well hidden," that "the captain of the gun who would fail at moderate range to hit it, when she pitches, must be a bad shot."

As to *ramming*, the battle of Lissa showed clearly that wooden converted ships could be used very effectively, and securely as rams; and with reference to this matter of "ramming," the following extracts from Channel Fleet Report, 1868, are, I think, of interest.

Admiral Warden says (page 7), "The subject is one which exists "principally in the region of speculation.

"The form of bow, which I believe best calculated to deal the

"hardest blow, and carry with it the greatest amount of destruction, "is the straight upright stem of the 'Achilles,' or the slightly curved "one of the 'Minotaur,' rather than the projecting prow of the 'Bel-" 'lerophon,' and others of a similar form. The result of the experience "gained when the 'Amazon' *rammed* a steamer in the Channel is not "encouraging."

Captain Armitage (page 42) says, "For general handiness for insuring "speedy evolutions, and for promptness of execution in giving effect "to ramming, the 'Bellerophon,' 'Royal Oak,' and 'Prince Consort' "possess considerable advantages over the class of longer vessels, "represented by the 'Minotaur' and 'Achilles.'"

And Captain Boys (page 37) says, "I am of opinion that the "'Minotaur,' 'Achilles,' and 'Warrior' can turn quick enough for all "evolutions under steam, and their manœuvring qualities would be "improved if they possessed rudder power corresponding to the 'Bel-" 'lerophon.'"

With regard to this question of quick-turning, or handiness, it appears not to be generally understood, that the "Bellerophon" has a balanced rudder, in ratio of 1 square foot to every 26 square feet of longitudinal section or area; the "Achilles" on the other hand has an ordinary rudder, with but 1 square foot of rudder to every 60 feet of longitudinal section or area; thus "Bellerophon" has 130 per cent. greater rudder surface than "Achilles." Moreover the "Bellerophon's" rudder, commands an angle of 38°; that of "Achilles" only 25°.

	"Achilles."	"Bellerophon."
Longitudinal area.....	10,038 sq. ft.	6,540 sq. ft.
Area of rudder.....	166 sq. ft.	252 sq. ft.
Angle of command	25°	38°

Accommodation, for Officers and Crew—I have assumed that a complement of 400, all told, would be a sufficiently numerous crew for such a ship, inasmuch, as the complement for the "Captain" now completing at Birkenhead is to be but 400. Yet there is ample space for a complement of 500, if necessary. The complement of the "Royal Sovereign" is but 300.

The poop is fitted up for the accommodation of the Captain and principal Officers, and has direct communication with the lower deck, which is fitted up for the other Officers and the crew in the usual manner, and the forecastle for petty officers and the hospital.

Ventilation is provided for by means of the iron tripod masts; the Turrets with through communication to the spar-deck; hatchways through forecastle and poop; and also by the side-tube scuttles, as at present fitted, or scuttles through the Monitor deck, as in the "Miantonomoh."

The capstans for heaving the anchors are worked by steam, as in the "Royal Sovereign."

In the holds there will be space to spare, as not more than one-half the present quantity of stores and provisions would be required. The spar-deck affords sufficient space for working the ship under sail,

catting the anchors, stowage of boats, &c., clear from the fire of the turrets beneath.

I will not enter into a refutation of the statements prepared by the professional Officers of the Admiralty, and made by the late Secretary to the Admiralty in laying the Navy Estimates before Parliament in 1867, but content myself with referring you to the following table, which gives my estimate of the weights of the "Duncan" *converted*, compared with the estimate of the weights of the vessels of the "Invincible" class, and of a turret ship of the same size and power proposed by the professional Officers of the Admiralty.

C.

General Particulars.	Admiralty.		Monitor, Duncan.
	Invincible.	Turret-ship.	
Length	280 feet	280 feet	252 feet
Breadth	54 „	54 „	62 „
Mean draught of water	22 „	22 „	25 „
Tonnage, b. m.	3,774 „	3,774 „	3,727 „
Displacement	5,899 „	5,947 „	6,268 „
Area of sails in square feet	25,813 „	25,813 „	29,404 „
Port sill above load-water line	8 „	11 „	7 ft. 9 ins.
Weight of one broadside	1,250 lbs.	1,600 lbs.	3,600 lbs.
Horse power	800	800	800
Speed in knots	13½	13½	12½
Complement	450	450	400
Armour on ship's sides	8″ and 6″	8″ and 7″	7½″
„ turrets or battery	6 inches	7½ inches	6 inches
Thickness of backing	10 „	10 „	18 „
„ plating behind armour	1¼ „	1¼ „	= 1½ „
Height of belt above load water line	4 feet	8 feet	4 feet
Thickness of plating on deck	$\frac{5}{16}$ ins.	$\frac{3}{4}$ ins.	1½ ins.
Weight of water, provisions, officers' stores, &c.	204 tons	204 tons	191½ tons
„ masts, yards, rigging, &c.	158 „	158 „	202½ „
„ cables, anchors, boats, and Warrant Officers' stores	141 „	175 „	195 „
„ armament (total)	339 „	264 „	414 „
„ engines, boilers, and water, engineers' stores, galley, &c.	830* „	830* „	598½* „
„ auxiliary engines	25 „	25 „	None.
„ coals	450 „	450 „	550 „
„ Total equipment	2,147 tons	2,106 tons	2,151½ tons
„ hull (and conning house, if any)	2,740 „	2,455 „	2,857½ „
„ armour on ship's sides and bulkheads	850 „	850 „	619½ „
„ backing	140 „	140 „	145½ „
„ turrets (without guns, &c.)	None.	397 „	491 „
Total weight complete for sea	5,877 tons	5,948 tons	6,265 tons

* The machinery in the Admiralty vessels includes surface condensers, &c., and is consequently much heavier than that of the "Duncan," which is not fitted with

You will observe, that the total weight of equipment of "Invincible" is 2,147 tons, and that of "Duncan" converted 2,151½ tons; now, it is not a necessity of my proposal, that this 2,151½ tons should be apportioned, as in column 3, it might without prejudice to my plans be made to approximate in detail to that of the "Invincible."

Now, this question of *weights* has invariably been made the *stalking-horse* of the Constructor's Department, for excluding designs and proposals emanating from private ship-builders.

For instance, in the Return, designs for ships No. 26, session 1867, most of the objections taken were on account of weights.

The Thames Company's ship was said to be 104 tons under the mark; that from the celebrated firm of Samuda Brothers, 255 tons under the mark.

And in this proposal of mine for converting the "Duncan," the professional Officers of the Admiralty make out, that the ship would weigh, if converted as proposed, 803 *tons* (!) more than I have estimated (in table C), thus—

My estimate of "Duncan," converted, complete for sea, is	6,265 tons.
Estimate by the professional Officers of the Admiralty, complete for sea, is	7,068 „
The actual weight of "Zealous," complete for sea, is	6,027 „
The actual weight of "Royal Oak," complete for sea, is	6,400 „
The actual weight of "Ocean" or "Prince Consort," complete for sea, is	6,600 „

Thus, *they* make the "Duncan" (converted) 1,041 *tons heavier* than 'Zealous," 668 *tons heavier* than "Royal Oak," (of the "Prince Consort" class, which are 20 feet longer), and 468 tons heavier than "Ocean," or "Prince Consort," which are 20 feet longer, are plated all round to the height of upper deck, their engines are 200-horse power greater and heavier, and they carry more coal.

How, or in what manner it is managed to create this additional 803 tons, I am at a loss to discover. What inference is to be drawn from this most extraordinary discrepancy?

Offensive Powers.—The armament is to consist of six of the heaviest

surface condensers, &c. The total weight, therefore, of the "Duncan" converted complete for sea is 6,265 tons. Her total weight complete for sea as a 90-gun line-of-battle ship is 5,950 tons. The weight of the converted ship is therefore 315 tons heavier; the requisite buoyancy for this additional weight is obtained from the displacement resulting from the doubling, backing, and thickness of armour, and by immersing the ship 3½ inches deeper in the water. Still, however, leaving the "Monitor" deck 4 feet 3½ inches above the load line of floatation, the mean draught of water when thus completed for sea being 25 feet. The actual weight at the ends of the converted ship would be *less* than at present in the 90 gun line-of-battle ship with all her guns at broadside, the transverse strain, therefore, will be *less*. Moreover, the two sides are strongly connected together by the iron plating on the deck and sides (in the converted ship), and the weights in the centre of the ship are well supported by pillars from the keelson under every beam throughout the ship.—C.F.H.

guns obtainable (say 600-pounders), two in each turret; also two 70-pounders on the upper deck.

The weight of broadside from turrets = 3,600 lbs.
" " " Bellerophon " = 1,250 "
" " " Hercules " = 1,600 "
" " " Invincible " = 1,250 "

The whole broadside of six guns—3,600 lbs., has a range from afore and abaft the beam of 104.° (See Diagram No. 4.)

Two guns can fire ahead within 10° of keel
" " astern "

DEFENSIVE POWERS. (See Diagram No. 3.)

" *Invincible.*"	" *Duncan*," *Monitor.*
Main deck battery :— 6″ armour, 10″ teak-backing. 2—$\frac{5}{8}$″ skins, and 10″ frames.	6″ armour, 18″ teak-backing. 1$\frac{1}{2}$″ skin on 10″ plank. 13″ frames and 8″ plank.
Upper deck battery :— 6″ armour, 7$\frac{1}{2}$″ teak-backing. 2—$\frac{1}{2}$″ skins, 7″ frames.	

The 8″ plates at load-water line, in the "Invincible" class, extend only about one-third of the length of the ship in midships, 15 inches above and 21 inches below the load-water line.

Excluding the frames in each case, and taking 1″ of wood to equal $\frac{1}{8}$ of an inch of iron, we have defensive powers of

"Invincible," at load-water line = 10$\frac{1}{8}$ in. of solid iron.
"Duncan," monitor " = 12 in. of solid iron.

Steadiness of Gun-platform.—The practical experience derived from the "Royal Sovereign" and "Miantonomoh," affords good evidence that the "Duncan," converted as proposed, would prove very steady in a seaway.

The "Royal Sovereign's" maximum angle of rolling has never exceeded 11° each way, and it has been stated that the "Miantonomoh" rolled only 7°. The absence of rolling in Monitors is, by Captain Coles, attributed mainly to the weights being central, and their lowness of freeboard; but I believe that much more depends on the disposition of weights than the absence of lofty sides (if not armour-plated); for it is well known that the "Achilles" is almost, if not quite, as steady in a sea-way as the "Miantonomoh."

We have already seen, that as regards disposition of weights, the moment of inertia in the broadside-ship would be over *five times* greater than in the turret-ship.

And in reference to this question, an observation of Admiral Warden's is worth noting; he says, "on the 26th September, 1866, the "'Lord Clyde,' with a force of wind No. 6, was rolling during the

"whole forenoon from 22° to 23°, and the average maximum roll from "8 to 12 o'clock, was from 26° to leeward and 21° to windward; the "rolling, though deep, was easy, the *peculiarity* being, that the ship "appears to *dwell*, at the end of the roll on each side, more than is "*usual* with ordinary ships."

This *peculiarity of dwelling* at the end of each roll, is the natural result of the enormous comparative "moments of inertia" of the heavy, lofty, iron-clad sides of these broadside-ships when once set in motion by the wind or waves.

Let us now compare the experience of the broadside-iron-clad, "Lord Clyde," with that of the converted line-of-battle ship "Royal Sovereign." The section of "Prince Consort" is sufficiently like "Lord Clyde" for illustration. (See diagram No. 3.) Admiral Warden says (on the 20th September, 1866). In the "Lord Clyde," although "the "precaution was taken of battening down the maindeck hatches fore "and aft, and only five guns on the port side were cast loose, it "was found utterly out of the question to fire at the target in any "other position *than* when head on to the sea; and the time occupied in "firing 15 rounds was about three-quarters of an hour. It was neces- "sary to steam round the target once or twice to bring the guns to bear "when the ship *rolled* to 28 degrees, whilst it did not exceed 10° to 11° "when head to sea.

"The *result* was, that the main deck was flooded with water to the "extent of flowing over the hatchways; the water poured in and out "of the guns, two shot rolled overboard out of them, and one was fol- "lowed by the cartridge. Two of the guns at different times got the "better of the crew, and banged in and out of the port several times "with extreme violence, and two of the slides were to a certain extent "damaged by it.

"It is needless to say that the practice was wild in the extreme, nor "do I believe that at any time there was the least probability that "we could have hit any enemy's ship, *except* by accident or miracle."

The gallant Admiral then put the question—"Could a turret-ship of "*equal size* and power have done better, or have proved herself more "efficient in powers of offence and defence?" and replies:—

"I think there are some considerations which would lead to this "question being answered in the affirmative.

"Suppose the turret-ship chose, or was obliged to take up a position "where the broadside guns of this ship would bear on her when they "could be fired, the *result* would be that the main deck of the 'Lord "Clyde,' and the Monitor deck of the turret-ship would be both flooded "alike; but the advantage would, as I think, still remain with the "turret-ship. The sea might, and probably would, wash right over "the deck of the turret-ship, but the water would be got rid of, "whilst in 'Lord Clyde' it is not at all clear that it *could* be got rid "of, and certainly, not as fast as it would accumulate.

"The guns being amidships on the line-of-keel, would not be subject "to such violent motion, and therefore more easily managed, and make "better practice. Moreover, it is not conceivable that the turret-ship "could roll so as to destroy the cartridges in the guns; whereas

"in 'Lord Clyde,' the larger portion, if not all, would be so de-
"stroyed."

Reporting on the performance of the "Royal Sovereign," Captain Sherard Osborn says (between the 28th August and 17th September, 1864), "I was on ten different days under weigh in the Channel, and "tested the vessel in weather ranging from a perfect calm, with "heavy swell, to a double-reefed topsail breeze, and a smart sea.

"On all occasions she behaved remarkably well; her extreme rolls "have only been 11° each way.

"The turrets and guns work admirably; we have now fired in all "177 rounds, under all circumstances; and I believe I see my way to "firing by night from a turret with as much accuracy as by day, so "long as the enemy is visible.

"I am of opinion that the 'Royal Sovereign,' as she now stands, "is the most formidable vessel of war I have ever been on board of."

The only objection appears to have been that, "when riding at "anchor in bad weather, the *drift* and *wet* blow along the deck in a "very trying manner, severely punishing those exposed in charge of "the watch." This also was the complaint against her when at the recent Volunteer Review at Dover. In the violent storm on that occasion, "no protection could be found on the upper deck from the vio-"lence of the weather, or the tons of water that 'skeet' over her "fore and aft. Under such circumstances Officers and men suffered "considerably."

This objection is entirely obviated in the proposed plan of conversion, by the spar-deck, poop, and forecastle; notwithstanding which, two guns can fire, either ahead or astern, within 10° of line of keel. Further, Captain Chamberlain, so late as 20th May, 1868, says:—

"I was present on board the 'Bellerophon' the day she fired at the "'Royal Sovereign,' and I was forcibly struck by the fact that fre-"quently the 'Bellerophon' could have got *no gun* to bear upon the "'Royal Sovereign' *anywhere*, whilst there was not a moment, so far "as I could see (except when the 'Bellerophon' was right ahead or "astern) that the 'Royal Sovereign' could not have brought *all* her "guns to bear at choice upon any spot on the 'Bellerophon' which "was in sight."

"It appeared to me then, and *the conviction remains on my mind*, that "the 'Royal Sovereign' *is* BY FAR *the more formidable machine* of the two."

I may here remark that, the height of the lower port-sill of the battery guns of the "Bellerophon" is 8 feet 9 inches, with only 400 tons of coal on board; with her full complement of coals, 600 tons, the port-sills would be about 8 feet 3 inches above the water; the port-sills of the "Duncan's" turrets would be, with 550 tons of coal on board, 7 feet 9 inches.

Endurance.—With reference to the endurance of the screw line-of-battle ships, I cannot do better than give you the opinion and experience of one of the most practical and experienced master shipbuilders of Her Majesty's Dockyards, who, writing to me under date 27th March, 1869, says:—

"I am of opinion that with proper care and ordinary repairs, they will "last from 30 to 35 years.

"To give an idea of the durability of our line-of-battle ships, I will "quote the following ships, viz., 'Nelson,' 'Prince Regent,' and "'Rodney.'

"I saw the 'Nelson' launched at Woolwich, and 45 years subse- "quently I converted her from a sailing-vessel to a screw steam- "vessel at Portsmouth; she is now on the Australian station.

"I saw the 'Prince Regent' launched at Chatham in 1822, and "in 1860 I converted her from a sailing to a screw-liner at Ports- "mouth.

"The 'Rodney' was built at Pembroke in 1833; in 1853 she formed "one of the Channel squadron, at that date I docked her at Portsmouth "to repair her false keel. She has been subsequently converted into a "screw-liner, and was lying in the ordinary at Sheerness in good "condition in 1866.

"When I cut down the 'Royal Sovereign' I did not find a bad "timber in her frame. Many liners have been broken up not because "they were rotten, but because they were considered obsolete."

Stability.—Much confusion with regard to this term has at times arisen for want of a common understanding as to its proper meaning, perhaps on account of its being generally considered in the light of a mere abstract mathematical problem; but the view taken of it by Captain Fishbourne commends itself to my mind as the most definite and intelligible, and I see no objection to its adoption in the mechanics of naval architecture.

He divides stability into hydrostatical and hydrodynamical.*

At rest, two ships may have equal hydrostatical stability, but when in motion, the practical or hydrodynamical stability may be greater or less in one than in the other.

In general it has occurred that those ships which have a comparatively large measure of hydrostatical stability have rolled much, and thence it has been inferred that stability was the cause, whereas the cause of rolling has been the large moment of inertia of the heavy and lofty iron-clad sides, for where the moments of inertia are large, the practical or hydrodynamical stability is small; some people imagining these two stabilities to be identical have been led into this error.

Diagram D has been headed "Stability of Monitors under Canvas," but I do not now propose to enter into that general subject, observing, however, that Monitors, if properly constructed, are quite capable of carrying a proper equipment of sails, the only difficulty I see, is how to work the sails conveniently without a spar-deck.

But with respect to the "Duncan," converted as proposed, it will

* When the word stability is used, it is intended to denote practical or hydrodynamical stability. When the term moment of stability is used, it is intended to denote moment of hydrostatical stability. *Hydrostatics* is that branch of mechanical science which treats of the nature, gravity, pressure, and equilibrium of fluids, and of the weighing of solids in them. *Hydrodynamics* is that branch which relates to the motion of non-elastic fluids, and the forces with which they act upon bodies opposed to them.—C.F.H.

be my object now to prove to you that she would possess more than sufficient stability, and be perfectly safe if fitted with her present sail equipment.

Statical, or more properly hydrostatical stability depends on the relative positions of the *metacentre* and *centre of gravity*.

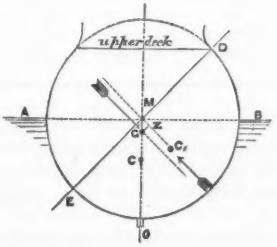
Allow me briefly to illustrate this in the following diagrams:

No. 1 is a section of a cylindrical form to the upper-deck, A B the line of floatation when at rest, G the centre of gravity, and C the centre of buoyancy. G, the centre of gravity, retains its position under every circumstance. Now let us incline this cylinder until D E becomes the line of floatation; C will then become the centre of gravity of displacement or buoyancy; the upward pressure of the water drawn through C will intersect the vertical MO in M; that point is called the metacentre, and the distance between G and M, the metacentric measure of stability. It will be obvious that there are now two forces brought into play, tending to restore the cylinder (or ship) to its vertical position, first the upward pressure of the water through the centre of buoyancy C, and the downward pressure of gravity through G, and since the weight and buoyancy are constant, whatever the angle of inclination may be, the distance GZ, the arm of the righting-couple or lever, multiplied by the total displacement or weight of ship, will be the *measure of hydrostatical stability*.

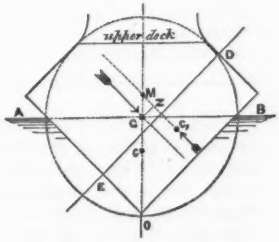
But if the centre of gravity be at M, it is clear the upward pressure of the water through C, and the downward pressure of gravity through M, would be in the same line, the one balancing the other, there would in that case be no tendency to return to the vertical, there would exist no *stability*.

The above applies in general to No. 2, although of a different form.

No. 1.



No. 2.



The position of the metacentre (M) results from the breadth of beam and displacement; the greater the breadth of beam in proportion to displacement, the higher the metacentre; the higher the metacentre, *cæteris paribus*, the greater the moment of stability.

The centre of gravity of the ship is the centre of gravity of all its component parts, and equipments.

The height of metacentre above load-water line in—

"Prince Consort"	of 6,696	tons	displacement, and 58′ 5″	beam, is	3·860′
"Achilles"	„ 9,484	„	„ 58′ 3½″	„	1·437′
"Duncan" (convtd.)	„ 6,268	„	„ 62′ 3″	„	7·58′

The centre of gravity of the total weight of the—

"Prince Consort,"	of 6,696	tons	weight, is	2·150′	below load-water line.	
"Achilles"	„ 9,484	„	„	1·571′	„	„ „
"Duncan" (convtd.)	„ 6,268	„	„	1·510′	„	„ „

The metacentre, therefore, above the centre of gravity, which is a comparative measure of hydrostatical stability in similar ships, is in—

"Achilles"	3,088 feet.
"Prince Consort"	6,010 „
"Duncan" (convtd.)	9,080 „

According to this measure the "Duncan" converted would possess 50 per cent. greater stability than "Prince Consort," and 200 per cent. greater stability than "Achilles;" but the weight of the ship forms the more important item in this question of hydrostatical stability as the following table of comparative moments of stability at indefinitely small angles of inclination will shew.

	Breadth of Beam.	Weight of Ship.	Metacentre above centre of gravity.	Moment of Stability.
Conqueror	55′ 6″	5,777 tons	× 4·889	26,514
Achilles	58′ 3½″	9,484 „	× 3·088	29,287
Orion	55′ 9″	5,101 „	× 6·127	31,257
Prince Consort	58′ 5″	6,696 „	× 6·010	40,243
Duncan converted	63′ 3″	6,268 „	× 9·080	56,913

Now, because in the "Achilles" this distance between the metacentre and centre of gravity (G M) is comparatively small, it has been assumed by some as being an infallible indication of steadiness, and "that her power of carrying canvas has been sacrificed in procuring "her exemplary steadiness."

It will, however, be seen by reference to table H, that no sacrifice of power of carrying sail has been made, and that she would carry quite well a fourth more sail power than she has at present.

Even if in another ship, this distance (G M) were "nearly such as "it is in ships notorious for their easy movements at sea," such as the "Achilles," it would afford no sure and certain ground for assuming or inferring steadiness, for in the case of the "Orion" and "Prince Consort" this distance (G M) is the same, yet the "Orion" is con-

sidered to behave well at sea, while the "Prince Consort" is one of the worst rollers in the Navy.

In further illustration, let us take the case of the "Prince Consort." (See Diagram No. 3.) Suppose we take out her engines of 1,000 horse power, and substitute engines of 800 horse power; this will give us, say, 200 tons altogether (with coals, &c.). Now let us convert this 200 tons into an armour-plated Sponson battery, and place it on the upper deck (like the "Invincible"); this would result in raising the centre of gravity and in making the distance between it and the meta-centre (G M) approximate more nearly to that of the "Achilles;" but, as I have already shewn, such an operation would simply cause the "Prince Consort" to roll even more heavily and deeply than she does now. It is clear, therefore, that this distance (G M) affords no infallible data for inferring steadiness.

Digressing for a moment: I was considerably surprised to find that a somewhat similar operation had actually been performed on board the "Pallas," to see if it would cause her to roll less heavily and deeply. It is well known (from Report, Channel Fleet, 1866) that "the 'Pallas,' "when steaming at 5 knots, wind 5 to 6, long moderate head sea, on "the 21st September rolled 34° one way and 34½° the other, although" (Admiral Warden states) "there was neither sufficient wind nor sea to "account for such a prodigious result. She had never previously "exceeded 33°, but that point or something approaching to it was "reached sufficiently often to justify me in saying that the extent to "which she rolls generally must be considered as a very grievous and "unfortunate defect."

From Report, Channel Fleet, 1868, it appears this "grievous and un-"fortunate defect" was attempted to be alleviated by placing 50 tons of iron ballast on the upper deck, and shifting 6 tons of shot from the shot lockers and round the lower deck to the tiller compartment, abaft the after ward-room.

But as the state of the weather during the whole of the 33 days' cruise was exceptionally fine, with very light winds and smooth water, it was not favourable for bringing out the full effect of this alteration. Yet there is conclusive evidence in the account of her rolling during this cruise that, under similar circumstances as the cruise of 1866, her rolling would have been simply exaggerated.

Again, in the case of the "Caledonia" as at present, and as if converted into a turret-ship, in both cases the hydrostatical (or statical) stability would be the same, that is, the centre of gravity and meta-centre would remain in the same relative positions.

But in the case of the turret ship, the hydrodynamical stability would be greater by reason of the smaller moments of inertia, as we have already seen, which would lessen the extent and violence of the rolling.

It is clear, therefore, in the case of the "Duncan," converted as proposed, that she would have a large amount of hydrostatical and hydro-dynamical stability, *i.e.*, would stand well up under her canvas, and would not be a heavy roller.

But, before proceeding further, it is well that I should endeavour to

prove to you the correctness of the position of the centre of gravity of the "Duncan" converted.

There can be no doubt about the position of the centre of gravity of the "Prince Consort," for it was ascertained by actual experiment. Its position is shewn on Diagram No. 3. The "Prince Consort," be it remembered, was a sister vessel to the "Duncan," was cut down, lengthened about 20 feet, the decks were lifted about 2 feet, she is fitted with engines of 1,000 horse power, and is armour-plated all round to the height of the upper deck, and her total weight, including equipments, is 6,696 tons.

It is known also by practical experiment the position of the centre of gravity in the line-of-battle ships. It was only necessary, therefore, in deducting the weights removed, to deduct their corresponding moments, and in adding the new weights, to add their corresponding moments; two independent calculations were made, the one shewing the centre of gravity to be 1·75 feet below the line of floatation, the other 1·510 feet below. To be on the safe side, I took the latter; probably it would be found by actual experiment to be a little lower, but that it is not situated higher is corroborated by the practical experiment on the "Prince Consort." A glance at Diagram No. 3 will shew that such must be the case, especially when we remember there are no lofty iron-clad sides extending all round the ship.

Having now, I trust, shewn the correct position of the centre of gravity of the total weight of the "Duncan" converted (viz., 6,265 tons), I will now proceed to shew—

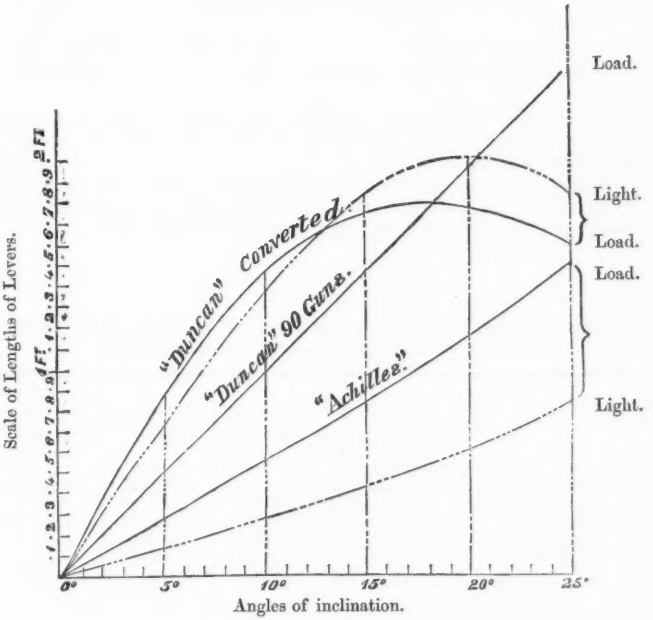
1st. That the moment of sails at any time would not be greater than the maximum stability of the ship, in fact, much less.

2nd. That the combined influence of the wind and the rolling of the ship at any time would not be greater than the stability.

The following diagram represents the length of the lever, or arm of the righting couples, at the various angles of inclination, at the ends of which the weight and buoyancy of the ship act to return her to the upright position.

D.

STABILITY OF MONITORS UNDER CANVAS.



"DUNCAN" CONVERTED (LOAD).

Inclination.	5°	10°	15°	20°	25°
Moment of stability.....	11,934,272	20,639,270	24,837,326	25,160,253	22,675,116
Moment of sails with a fresh breeze, all plain sail set	2,720,000	2,703,697	2,658,121	2,594,608	2,594,042
Moment of stability greater than moment of sails	4·4	7·6	8·5	9·7	9·0

Thus, at 10 degrees of inclination the length of the lever in the "Achilles" is ·55 feet, and in the "Duncan" converted 1·47 feet.

These lengths, multiplied by their respective weight of ship, give the moment of stability in units of lbs. at 10°.

	"Achilles."	"Duncan" (converted.)
Moment of stability	11,744,320	20,639,270
Moment of sails	2,771,340	2,703,696

So at 10° of inclination, the "Achilles" has more than four times greater moment of stability than moment of sails, and "Duncan" converted more than seven times.

A comparison of moment of stability and moment of sails, at 10° of inclination, of modern ships and ironclads with sailing vessels which have carried their sails well, is made in the following table:—

II.

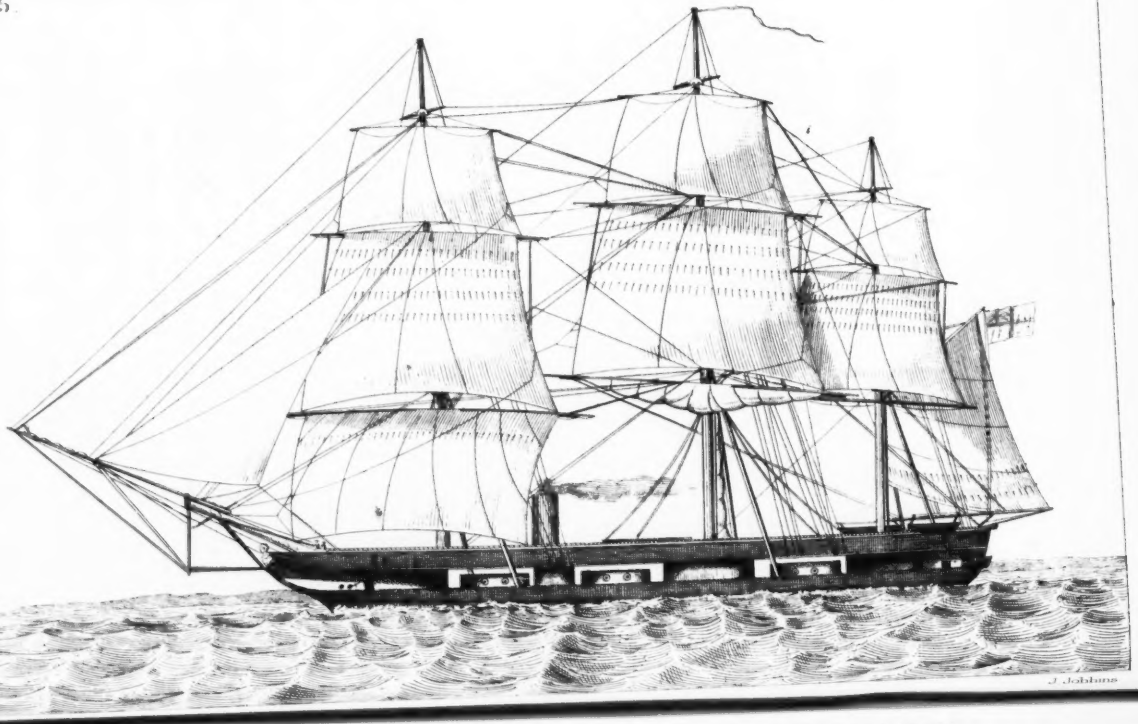
MOMENT of Stability at 10°, and Moment of Sails, in Ships which have carried their sails well.—(Fincham.)

Rates.	Moment of Stability.	Moment of Sails.	Moment of Stability: Moment of Sails.
Three Decks.....	7,732,480	2,632,121	2·94
Two Decks	4,945,920	1,750,165	2·82
Frigates.....	3,689,280	1,276,577	2·89
Sloops.....	1,225,280	554,484	2·21
Brigs, 18 guns	916,160	442,413	2·07
Brigs, 10 guns	463,680	247,645	1·87
COMPARED WITH.			
Conqueror.....	10,310,720	2,871,300	3·59
Duncan, 90 guns	12,761,280	2,871,300	4·44
Orion.....	12,178,880	2,871,300	4·23
Achilles.....	11,744,320	2,771,340	4·23
Prince Consort.....	15,650,880	1,741,934	8·99
Duncan converted.....	20,639,270	2,703,691	7·64

NOTE.—Suppose a sufficiently strong boom, extending from the ship's side to a distance of 50 feet from the centre of gravity of the ship, it would require a weight at its extremity of 92 tons to heel the "Conqueror," to an angle of 10 degrees; 113 tons, "Duncan," 90 guns; 108 tons, "Orion;" 104 tons, "Achilles"; 139 tons, "Prince Consort;" and 184 tons, "Duncan," converted as proposed.

And at 20° of inclination the length of the lever in the "Achilles" is 1·175 feet, in the "Duncan" converted is 1·792, which multiplied by their respective weight of ship, gives the moment of stability in units of lbs.—

Diagram No. 5.



J. Jobbins

	"Achilles."	"Duncan" (converted).
Moment of stability	24,978,240	25,160,253
Moment of sails	2,662,011	2,594,608

So also at 20° of inclination, the "Achilles" has more than nine times greater moment of stability than moment of sails, and the "Duncan" converted, nearly ten times. But I will now endeavour to shew you that no steady wind nor sudden squall would cause her to incline to even 10°.

Diagram No. 5 represents the "Duncan" converted, and under all plain sail, except that the main course is not set.

SAILS COMMONLY SET "BY THE WIND."

No.	Winds.	Pressure in lbs. per square foot. from	to	Sails.
1	Light airs	·006	·050	Courses, topsails, top-gallant sails, royals, spanker, jib, flying jib, and all light sails.
2	„ winds ...	·090	·140	Ditto ditto ditto
3	„ breezes ..	·200	·270	Ditto ditto ditto
4	Moderate „ ..	·360	·450	Ditto ditto ditto
5	Fresh „ ..	·560	1·270	Royals and flying jib taken in, in a seaway, to two reefs in the top-sails.
6	Strong „ ..	1·450	2·270	Single reefed topsails, and topgallant sails, in much sea, two reefs in topsails, to taking in top-gallant sails.
7	Moderate gales ..	2·500	3·540	Double reefed topsails to treble reefed topsails, reefed spanker and jib.
8	Fresh gales	3·800	5·100	Close reefed topsails, reefed courses, to taking in spanker, jib, fore and mizen topsail.
9	Strong gales	5·440	6·940	Reefed courses, close reefed main topsail, fore staysail, mizen trysail, to taking in the mainsail.
10	Heavy gales.....	7·340	9·000	Close reefed main topsail, storm staysails to storm staysails only.
11	Storms.....	9·530	13·630	

The calculated moment of sails is always reckoned at 1 lb. on the square foot of sails, of "all plain sail," a fresh breeze, No. 5, 12 knots an hour. Yards braced in a line with the keel to receive the full impact of the wind.

Now, at an inclination of 5°, the

Moment of stability is	11,934,272, and
Moment of sails	2,720,000

The pressure of wind on the square foot of "all plain sail" to incline the "Duncan" to an angle of 5° would be 4·4 lbs., which force equals wind No. 7, moderate gale, 25 knots an hour.

But with wind No. 7—a moderate gale—"all plain sail" would not be set, but only *double-reefed topsails, courses, fore-topmasts, stay-sail,* and *double-reefed spanker;* therefore, with this reduced amount (and moment) of sail, being one-third less with wind No. 7, she would not nearly approach to even 5° of inclination.

For referring to the report of Channel Fleet 1864, under Admiral Dacres, on the 2nd and 3rd of March, with the force of wind about 7, all the ships, "Edgar," "Warrior," "Black Prince," and "Defence," were under reefed sails, and even with that force of wind, on 2nd March "Defence" split a main topsail and topgallant-sail, and carried away some spars.

When sailing at about six points "near the wind," with the yards braced at 25° with the line of keel, the wind will then strike the sails at an angle of 42°.

In a "strong breeze" (2 lbs. on the square foot) at 42°, the oblique impulsion would be to the direct as ·543 is to 1; even the whole of this force will not be exerted to incline the ship, but the part only that acts perpendicularly to the longitudinal axis of the ship; the force of the oblique impulsion must, therefore, be reduced according to the co-sine of the angle which the sail makes with the longitudinal axis of the ship.

The co-sine of 25°=sin. 65°=·906, and the moment of sails (all plain sail), 2,740,452; consequently, we have (inclination of ship not being taken into account) ·534 × 2 lbs. × ·906 × 2,740,452=2,630,834—the pressure of the wind on the sails to produce the inclination.

The moment of stability at 2° is	5,264,000
Moment of sails, all plain sail, with No. 6 strong breeze (2 lbs. square foot), sailing six points near the wind, yards braced 25°, is	2,630,834
Moment of sails (4 lbs. square foot), No. 7 moderate gale, sailing six points near to wind, yards braced 25°, is	5,261,668

Therefore, if all plain sail could be carried with No. 7 moderate gale (4 lbs. on the square foot), the "Duncan" converted would then heel to 2° only, *i.e.*, when sailing six points near the wind.

There is no probability, therefore, that, under any circumstances of wind, considering the enormous preponderance of stability, the vessel would ever be inclined by the force of wind even to 5° of inclination, and certainly not to 10°.

Then as to the second point, What is the probable maximum angle of inclination under the combined influence of wind and waves? We have seen that the maximum angle of rolling of the "Royal Sovereign" never exceeded 11°, and there is every reason to believe that these converted ships, having great practical or hydrodynamical stability, would roll less, and prove even more steady in a seaway. We will assume, however, she would roll to 11°, and at that instant

a sudden squall caught the ship, say with sails set for No. 5 or 7 wind, if the sails did not split and give way, the effect would be to heel the ship to three or four degrees more, say to 15°, at which angle the moment of stability is 8½ times greater than the moment of all plain sail.

It will, I think, be apparent, therefore, that no combination of wind and waves, is likely to cause an inclination so great as 15°, for, be it remembered, these converted Monitors would not roll so heavily, nor so deeply, as the lofty iron-clad broadside ships.

A very confident writer on naval matters has stated that these converted turret-ships would capsize in a gale of wind; but there is no limit to which wild and nonsensical theories may be carried if assumption be admitted as the basis.

For example, if we *assume* the centre of gravity to be at M (Diagram No. 3), there would be no stability at all; and, of course, the higher the centre of gravity is *assumed* to be, the less would be the stability. If we *assume*, also, that the sails won't split, and the spars won't give way, why, under all these *assumptions*, which may be applied to the "Bellerophon," or even "Achilles," it might be demonstrated on paper that they even would capsize in a gale of wind.

But in all such matters we must be guided by experience, not mere theory—facts, not imaginations.

Spare Buoyancy.—The Monitor deck being 4 feet 3½ inches above the load line of floatation, provides for a large amount of spare buoyancy. The requisite amount of buoyancy to float the ship when equipped for sea is 219,380 cubic feet, and the spare buoyancy, viz., that comprised between the load line of floatation and the Monitor deck is 45,300 cubic feet, *i.e.*, a margin of buoyancy of 25 per cent.

The term *sea-going* was, I think, pretty well defined by the Secretary of the Admiralty—as a vessel which could go to sea and remain there for weeks; the requirements for such are much greater than for a mere harbour vessel, and would be somewhat less than for an ocean cruizer; but I do not intend these vessels as ocean cruizers, but simply as improved "Royal Sovereigns," suitable for Mediterranean or Channel service.

It has also been asserted that twenty-five of these converted ships together would be unable to cope with even one such ship as might be built new for one-sixth the cost, *i.e.*,

Twenty-five converted ships would cost.. ..	£2,500,000
One-sixth would be..	425,000

barely the cost of one "Bellerophon;" but this one wonderful ship, which was to be superior to twenty-five converted ships, was to be plated with 15 to 16 inches of armour, to carry 22-ton guns, and steam at 15 knots an hour. This vessel, however, still remains in the airy regions of imagination, although I observe the proposed two new Monitors somewhat approach to it in thickness of armour and in guns; but, alas! for the speed, the splendid 15 knots has dwindled down to 12½ knots, in spite of the enormous power of 5,600 horses to propel them.

The following table gives the general particulars of the proposed new Monitors and improved "Hotspur:"—

	New Monitors without Sail Power.	Duncan, without Sail Power.	2nd Hotspur small Sail Power.	Duncan, full Sail Power.
Tonnage	4,400	3,727	3,200	3,727
Draught of water	25 ft. 6 ins.	25 ft. 0 in.	25 ft. 6 ins.	25 ft. 0 in.
Horse-power	800	800	700	800
Speed in knots	12½	12¼	12	12¼
Coals carried	1,750 tons	550 tons	350 tons	550 tons
Consumption at 10 knots for	12 days	7 days	3½ days	7 days
Guns	4 of 25 tons	4 of 25 tons	2 of 18 tons	6 of 25 tons
Weight of broadside	2,400 lbs.	2,400 lbs.	800 lbs.	3,600 lbs.
Height of Monitor deck above load-water line	4 ft. 6 ins.	4 ft. 3½ ins.	1 ft. 6 ins.	4 ft. 3½ ns.
Armour on sides	12 ins.	12 ins.	11 ins.	7½ ins.
„ on deck	2½ ins.	=2 ins.	2 ins.	=2 ins.
Crew	250	250	200	400
Cost	£286,000	£100,000	£195,000	£100,000

The particulars in fourth column are of "Duncan," as proposed to be converted; second column shows what might be produced by conversion, and by giving up the spar-deck, poop, forecastle, and sails, which, however, I consider would be most *undesirable;* not only on account of the comfort and convenience of the crew, but I am of opinion that all vessels of war, except mere harbour-defence-vessels, should be able to proceed to their destination without the aid of steam and expenditure of fuel. In the case of these new Monitors, they would have to be towed, or to tow a collier after them to enable them to proceed to any distant station.

The following table gives the state of Navies in the year 1840, little more than a quarter of a century since:—

STATE OF NAVIES IN 1840.

	Ships of the Line.	Frigates.	Smaller Classes.	Total.
England	120	130	307	557
France	54	65	213	332
Russia	50	38	60	148
Holland	18	26	50	94
America	18	16	40	74
Sweden	13	15	60	88
Spain	15	18	40	73
Austria	3	8	61	72
Denmark	5	8	20	33
Portugal	4	6	40	50

The state of Navies at the present time is taken from official statements, and is as follows:—

Official Statements of Strength of Navies in 1868-9.

British Navy. Total, 113 vessels of all classes—

47 Ironclads (including three old floating batteries).
12 Screw ships of the line and frigates.
3 Inconstant, Active, and Volage.
12 as Blanche } Amazon class.
2 as Druid }
12 Wooden gun vessels.
17 Composite gun vessels.
8 Heavy corvettes.

French Navy. Total, 332 vessels of all classes—

50 Ironclads.
96 Screw steamers.
91 Despatch vessels and Tenders.
95 Transports, various.

United States' Navy. Total, 206 vessels of all classes—

52 Ironclads.
95 Screw steamers.
28 Paddle steamers.
31 Sailing vessels.

Italian Navy. Total, 94 vessels of all classes—

22 Ironclads.
22 Screw steamers.
22 Paddle steamers.
6 Sailing vessels.
12 Screw transports.
9 Paddle ditto.
1 Sailing ditto.

I have not been able to obtain a detailed list of the French and American Navies, but give our own navy in detail, as to ironclads; the three floating batteries, making a total of 47, are excluded as worthless.

PRESENT IRONCLAD OCEAN FLEET.

Built.

No.	Name.	Length.	Tonnage.	H.P.	Cost.
		Feet.			£
1	Agincourt	400	6,621	1,350	450,233
2	Minotaur	400	6,621	1,350	462,441
3	Northumberland	400	6,621	1,350	435,971

No.	Name.	Length.	Tonnage.	H.P.	Cost.
		Feet.			£
4	Warrior	380	6,019	1,250	360,995
5	Black Prince	380	6,019	1,250	364,647
6	Achilles	380	6,019	1,250	458,571
7	Hercules	325	5,234	1,200	450,000
8	Bellerophon	300	4,270	1,000	459,098
9	Ocean	273	4,047	1,000	285,821
10	Caledonia	273	4,125	1,000	299,491
11	Prince Consort	273	4,045	1,000	249,207
12	Lord Clyde	280	4,067	1,000	342,733
13	Lord Warden	280	4,080	1,000	408,705
14	Hector	280	4,089	800	288,146
15	Valiant	280	4,089	800	316,705
16	Royal Oak	273	4,056	800	259,442
17	Royal Alfred	273	4,068	800	339,226
18	Zealous	252	3,716	800	256,221
19	Resistance	280	3,710	600	247,333
20	Defence	280	3,720	600	241,168
21	Penelope	266	3,096	600	240,000
	Building.				
33	Monarch	300	5,102	1,100	366,000
34	Captain	320	4,272	900	335,000
35	Sultan	325	5,226	1,200	450,000
36	Audacious	280	3,774	800	250,000
37	Invincible	280	3,774	800	250,000
38	Vanguard	280	3,774	800	250,000
39	Iron Duke	280	3,774	800	250,000
40	Triumph	280	3,893	800	250,000
41	Swiftsure	280	3,893	800	250,000
42	Repulse	252	3,749	800	256,000
	PRESENT NONDESCRIPT FLEET.				
	Built.				
22	Pallas	225	2,372	600	244,889
23	Favourite	225	2,094	400	180,732
24	Research	195	1,253	200	75,189
25	Enterprise	180	993	160	68,355
26	Waterwitch	162	778	160	58,883
27	Vixen	160	754	160	57,555
28	Viper	160	737	160	52,475
29	Scorpion	224	1,833	350	110,960
30	Wyvern	224	1,899	350	116,601
31	Royal Sovereign	240	3,765	800	150,475
32	Prince Albert	240	2,529	500	225,847
	Building.				
43	Glatton	245	2,709	500	250,000
44	Hotspur	235	2,639	600	250,000

Ocean fleet built, 21 in No.	£7,225,252
„ building, 10 in No.	£2,907,000
Nondescript fleet built, 11 in No.	£1,341,961
„ „ building, 2 in No.	£500,000
Total first cost ships and engines, in 10 years	£11,974,213

Throwing aside the "smaller classes" of ironclads and unarmoured vessels, which are, perhaps, as numerous to-day as in 1840, we have ocean ships of war, built and building .. .. 31 in number. as against ships of the line, and frigates of 1840.. 250 „

If our maritime position was satisfactory, and what it ought to be in 1840, the question is, is it now, in 1869?

Have we a fleet such as this empire ought to possess for its own security?

The general opinion is, I believe, that our maritime defences are very far from being in a satisfactory condition; and the late Secretary to the Admiralty, in July last, confirmed this opinion by stating in Parliament that, "We could not shut our eyes to the fact that the "French were getting an *enormous* ironclad fleet together; they were "already on an *equality* with ourselves." This statement was further endorsed by Admiral Sir John Hay, a few months later. "It was "found," he said, "when the late Admiralty took office, France had "*six* ironclads more than we had, but they decided at once to redress "the balance."

This country is now, therefore, merely *on a par* with France as regards maritime power, whereas but 25 years since we were nearly twice as powerful as France, four times as powerful as Russia, and eight times as powerful as America.

It is clear, therefore, that our maritime power has fallen enormously from what it was a quarter of a century since.

Mr. Cobden, who was assuredly not the least zealous of the friends of peace, or the least rigorous and acute of the critics of our naval expenditure, once declared his conviction that the British Navy should always be, *at least*, the match for *any two navies* that could be brought against it.

What, therefore, should be done to place this country in its proper position promptly, efficiently, and economically?

It is universally admitted that there exists at the present time no one type of ship-of-war which it would be desirable to perpetuate. There are good qualities in some which are not possessed by others. In some thick armour and heavy guns, but wanting in speed and ocean-going qualities; while others have a maximum of speed and ocean-cruizing qualities, but are lacking in maximum effective guns and thickness of armour. The *typical ship* on which to found our *future navy* has not yet been built. And as each vessel of the "Hercules" and "Sultan" class will cost roundly half-a-million of money, and require at least three years to build and equip, any large addition to our Navy may well cause us to recoil, for 12 vessels of the "Hercules" or "Sultan" class would cost about £6,000,000, and require six years to build and equip; and considering the rapid progress made within the last ten years in the

science of attack and defence, it is probable that before they would be completed, they would have become comparatively obsolete and ineffective, as so graphically portrayed in a leading article on the Naval Review at Spithead, in July, 1867—"If," said the *Times*, "ten "years has been sufficient to antiquate one division of the fleet (the "unarmoured screw line-of-battle ships), may not another ten years "do the same for the other (the broadside ironclads)? In this case, "our regrets will be more poignant, for these ironclads are even more "costly—running away with half a million a piece," and concludes, "even if we must have ironclads, and nothing but ironclads, cannot "we have them on more reasonable terms?" Seeing, therefore, the enormous outlay in money and the time involved in supplying the country with merely twelve *new* ironclads, and considering that we are in a transition state as regards our Navy, is it wise to build more vessels, costing from a quarter to half a million a piece, not only until those at present built and building have been fairly and honestly tried, their defects discovered, and improvements suggested; but until a Royal Commission shall have decided—

1stly. By an examination of the most eminent and experienced of our naval officers, as to the most efficient type of ship of war for the several services of the country (for they are undoubtedly the most proper judges as to the various requirements of such services).

2ndly. By an examination of the most eminent and experienced of the naval architects of the country, as to the best means of efficiently and economically embodying such requirements, as may be determined on by the Royal Commissioners, in future ironclads, whether for ocean, harbour, or special service. And

3rdly. The number of each class necessary to maintain our maritime pre-eminence?

And pending such enquiry by a Royal Commission, to utilize at a moderate cost those of our screw ships of the line, which are sufficiently sound, by converting them into sea-going "Monitors" or improved "Royal Sovereigns;" for these ships are ready to hand, and could be converted in a short time at a moderate cost.

It will have taken just ten years to supply the country with an ocean fleet of ironclads, 31 in all (including 21 built and 10 building), at a cost of £10,132,252—this is at the rate of three annually, and at an average cost of £326,782 a piece. Even at this rate, to add 12 ships to the Navy it would take four years, and cost £3,921,384; while the 12 line-of-battle ships, in the following table, might be converted into improved "Royal Sovereigns," as this model, in one year, and cost but £1,200,000:—

SCREW LINE-OF-BATTLE SHIPS.

Proposed Fleet of Transition.

Name.	Length.	Tonnage.	H.P.	When Launched.
	Feet.			
Victoria	260	4,121	1,000	1859
Howe	260	4,127	1,000	1860
Marlborough	246	4,000	800	1855
Prince of Wales	252	3,994	800	1860
Duncan	252	3,727	800	1859
Gibraltar	252	3,727	800	1860
Each of the above fitted with 3 double-barrelled turrets.				
Atlas	245	3,336	800	1860
Renown	245	3,336	800	1857
Revenge	245	3,336	800	1859
Donegal	240	3,245	800	1858
Defiance	255	3,475	800	1861
Anson	245	3,336	800	1860
Each of the above fitted with 2 double-barrelled turrets.				

The first cost of the above 12 ships is about	£2,500,000
The value of the above 12 Ships, at Shipbreaker's value	£120,000
Cost to convert " "	£1,200,000
Value of " " when converted	£3,921,384

Resulting in a nett saving of £2,721,384, in addition to placing the country promptly in a more efficient state of defence.

APPENDIX.

OPINION OF ISAAC WATTS, ESQ., C.B. (LATE CHIEF CONSTRUCTOR OF THE NAVY), TO ADMIRAL E. P. HALSTED.

(*Extract from a Letter, August 24th*, 1866.)

"We know not what the result may be of passing events, but we "should not omit being prepared for the worst. A fleet such as "England may require cannot be provided in a day: we ought hence "not to lose a moment.

"Henwood's plan would enable us to provide, in a comparatively "short time, a number of useful ships for the protection of the "country and its commerce, until better ships, such as you propose, "can be procured. And as it is almost entirely iron work which "would be required in the conversion, ships might be sent to such

"firms as Napier's, Laird's, and others, for reconstruction. The dock-"yards alone would not be equal to the occasion.

"The more I reflect on Henwood's plan, the more I am convinced "that, on the whole, the arrangement is excellent. For many stations "the ships would be as good as could be desired."

The CHAIRMAN: Would any gentleman like to make any remarks, or to ask any questions in order to elicit additional information? I should like to ask, first of all, what are the poop and forecastle composed of? Next, how far the fire of the turrets is interfered with by the tripods? Next, what is the security for men on the monitor deck? Then, are these masts instead of tripods?

Mr. HENWOOD: No; iron tripod masts. It is all iron joined together in the centre.

The CHAIRMAN: Is there any rigging at all?

Mr. HENWOOD: Yes, rigging to the topmasts.

The CHAIRMAN: But none on the hull?

Mr. HENWOOD: Not on the lower part of the hull. The tripods form the shrouds for lower masts.

Admiral Sir EDWARD BELCHER: I would make one or two remarks, if you please, upon this subject. In building a wooden ship, she is calculated to bear the strain of the woodwork of which she is composed. Her riders, her ribs, are all calculated, if the vessel should take the ground, to support her whole frame. But if a vessel of the "Royal Sovereign" class, not entirely constructed of iron, should take the ground, we should witness what is constantly occurring with wooden ships. No wooden ship has yet been constructed that when she leaves the dock does not rise amidships—she becomes, to a degree, hogged, and all builders meet that difficulty by giving the vessel, as it were, a lift at either end. Now, if a vessel in dock, shored up and covered with Mr. Henwood's iron-plating, had her shores knocked away, I think it would be found, as I believe it did take place in the "Royal Sovereign," that a rise of a certain number of inches rather alarmingly would take place in her midships. But if Mr. Henwood's vessel took the ground, and came upon the ground with all her force, she would inevitably drive her bottom in. To sustain the quantity of iron which is placed upon our iron-clads, it is necessary that all the parts of the vessel should be calculated to sustain the great weight placed upon their sides. As far as the metacentre is concerned, and as far as, in plain language among seamen, rolling is concerned, I have probably tried that point to a greater extent than any naval Officer. I commanded a bomb-vessel. She had ten tons on her upper works, at least on a level with her main deck, as a bomb; in that ship I carried with me to sea a heavier weight of boats on her upper deck and out to her extreme side than a line-of-battle ship usually carries. I carried two decked vessels, 36 feet long and 10 feet beam, coppered and everything complete. I carried two line-of-battle ship carvel cutters, of 25 feet on the quarters. I carried eight boats altogether. So dangerous did it appear to Sir Michael Seymour that he said he would not allow me to hoist the boats in; he insisted upon their being hoisted in and placed on my deck with the shear-hulk; and all the captains in Portsmouth in 1830 came to see the thing done. As soon as I was away from the shear-hulk I hoisted them out, rigged them, and sent them to Spithead. I was in that vessel in heavy gales, and she never felt the weight of those boats. That vessel was only 350 tons. The next vessel I had, the "Samarang," was 600 tons, and she had a precisely similar set of boats. Yet, running in very high latitudes in the Southern Ocean, going before the wind at 12 knots, a man was washed out of the main chains, but that ship was stable enough to tack, and allow the life buoy to be brought under her lee. But the man who had been struck was killed. Therefore, it does not follow because a naval constructor—(I am a naval constructor myself; I have had my hand to the tools, as well as other men)—says a ship is uneasy, the ship in the hands of a competent Officer may not be quite easy. There is the case of the Bellerophon. The Bellerophon of old in a calm rolled her masts away, and she was never brought to sail until the late Admiral Hawker had the command of her under Sir Richard

Keats. Then she was so much improved in sailing, in weatherly qualities, and absolute deficiency of rolling, that there was not a frigate that could have competed with her. We chased three of the fastest American privateers. They escaped us by mere chance, but we outran them; we could have captured them if it had not been for the fog on the bank of Newfoundland. The objection to Mr. Henwood's ship is, that it is almost basket-work. The vessel is cut away upon her sides, and all that which should support her upper deck fore and aft is removed; she becomes a basket. She has not the power of the "Royal Sovereign" of firing directly ahead and directly astern or an all-round fire; and in four cases on the broadside the tripods would interfere with the guns. And not only that, those guns will not fire clear of the tripods, and you must allow an angle of at least five degrees on the other side to prevent the concussion blowing them away. Therefore it is not strictly correct to say the vessel possesses all-round fire. Again, I strongly believe, from what I have seen, particularly in the case of the "Warrior," that guns fired over the upper deck shake the deck on the forecastle and the aft part of the ship very considerably. The "Warrior" was built originally, so Mr. Scott Russell told us at the Institution of Naval Architects, to fire right ahead and right astern; and should it become necessary to defend herself, for she has four ports cut in her transverse section, the bulk heads of her box, it would only require the carpenter to knock away the bulwarks, and she could fire ahead or astern. That is, Mr. Scott Russell would demolish the ship to get his fore and aft fire. When we come to iron-clad vessels, and to turret work, I think it should be a *sine quâ non* that the guns should look right ahead and right astern, and nothing should obstruct them. The two vessels which are now under the consideration of the House of Commons will have that advantage of their guns seeing clear ahead and clear astern. I understand Mr. Reed has declared that he will not divulge what they are to be; but I think from his negative answers we may almost infer that they are to fire right ahead and right astern. The question of expense is, like all other questions that are drawn out upon paper; when you come to pay the bill you will find it is a very different matter. The estimated cost of altering these ships has been declared to be equal to the cost of building a new ship.* In fact, the process is something like re-covering an old umbrella, which is not of much use when re-covered. If we are to have ships fit to represent this country, I think we should build them of iron, in every respect fit for all the purposes of war. I do not believe that any sheathing put on the "Royal Sovereign," or on any other ship, will render her such a ship as the British Navy should trust to.

Mr. CHARLES LAMPORT: I do not know whether you extend the courtesy of a hearing to those gentlemen who appear here as visitors. [The CHAIRMAN: Certainly.] If so, I will ask your permission to make a remark or two upon what has fallen from Sir Edward Belcher. In the first place, I think the gallant Admiral has fallen into the common mistake of considering that a pound of feathers is lighter than a pound of lead. Now I, as a practical shipbuilder, can see no difference whatever in a certain weight put upon a ship, whether it consists of iron or whether it consists of wood. Mr. Henwood, in his lecture, has clearly shown us that he takes away from the sides even a larger amount of weight than he adds in armour. I am disposed to think that the question of strain upon the structure of a ship will remain very much a question of dynamical force, which Mr. Henwood has explained, or a question of construction in what is added in relation to that which has been taken away. If I understand him aright, he proposes to put on two plates over the deck, each three-quarters of an inch thick, making a total of an inch and a half of iron in that position in the ship, which all nautical men and shipbuilders believe to be the weakest part, and which Dr. Fairbarn most essentially states ought to be strengthened. My opinion is that that amount of iron put into that position may be made, not a source of weakness, but the source

* I have tendered to the Board of Admiralty to convert the "Duncan" as proposed for the sum of £100,000, in nine months, and under the usual guarantees.—C. F. H.

of a very large amount of strength to the structure. If you look at the diagrams which Mr. Henwood has put up there, you will see that there is a large amount of teak wood added; and that teak wood, if it is scientifically and properly applied may be also made to increase the strength of the structure. Over this, no doubt, comes very heavy armour. I am not sufficiently acquainted with that to be able to say whether armour may or may not be put on so as to add to the strength of the whole of the ship. But I fall upon the opinion which I ventured first to assert, namely, that the weight added at the sides, if it be not greater than that which is taken away, will not task the strength of the ship more than before. Sir Edward Belcher has spoken of buoyancy, but I think what Sir Edward means is a question of comparative displacement, and that in the one case there is not the sustaining power in water that there is in the other. But I ask you to look at the amount of armour plate, and I also ask you to look at the amount of wood that is put under it; and I venture to say that, taking the whole, you will get a larger displacement of water, and a larger support to sustain the weight than you would before conversion. I think the next point that Sir Edward Belcher brought before us was, that these ships, whatever may be their qualities, are not the ships the British nation ought to trust to. Now, I never gathered from anything Mr. Henwood said that he intended these ships were to be considered a permanent portion of the Navy. He said they were a makeshift, to help us to tide over the interval between our obtaining the hoped-for ship of the future and the present imperfect state of the Navy. I think he put very clearly before us that we, as a nation, require a greater amount of offensive power on the water than any other nation, and that we do not possess that in the degree in which we ought to possess it. He also put before us clearly that we are not in a position to be able to say what is the best form of ship upon which we ought to spend our money. Nautical men are undetermined about that; constructors are at sea still; and those Civil Lords who come down to the House of Commons, and talk about naval matters, are not satisfied about it. So that, in this maze of uncertainty on the one hand, and the impelling necessity on the other, the necessity of having a force equal to cope with the forces of other nations; I think, when Mr. Henwood shows us that we have rotting in our harbours a fleet of ships that may be so strengthened and made serviceable for purposes of war, that he has shown us a way out of a difficulty, as to which all may agree. Mr. Henwood used the term, the "typical ship of the future." I should like to know what that ship is. For my own part, as a shipbuilder, I believe that ship is still *in nubibus*. I believe we shall never get that typical ship of the future; it is perfectly absurd to attempt it. Just for this reason, that we require ships for totally different purposes. I put it to you whether that sort of ship which is the most capable of defending our harbours and coasts, where there is a small depth of water, is the sort of ship that you would consider the best to go to sea? In other words, are the requirements for defence perfectly similar to those for aggression? Then, again, if we go to war, with what countries are we likely to go to war? I am not sure that I am not trenching on a subject which is not before us; but if we do go to war, we most likely will go to war with Russia on account of her encroachments in India, or go to war with America on account of the "Alabama" question. I will only ask your attention for one moment. Consider what we should aim at if we were at war with either of these countries. In order that our commerce may be protected, we must seal up the Baltic; we must send ships there that can keep there, in order to cope with the Russian turret ships. We must maintain our ships there from year's end to year's end. Now, will the box-broadside-armour-clads enable us to do that? I believe not. I believe, if we sent our ships either to the Baltic or to India, in order to preserve our commerce in a war with Russia, that they would become so foul that the Russians would be enabled easily to cope with them in the condition in which they would meet them. Again, if we go to war with America, what should we do if we attempted anything like aggression? Should we send our huge iron-clads to blockade the American coasts? Is it possible to blockade the whole of a sea-board like that of the United States of America? It is absurd to suppose such a thing. We might

blockade New York, Boston, and some of the shipping ports, and what then? Our ships must maintain themselves there, and they must be able at all times to sail faster than those vessels which would attempt to run in or run out, or war ships which might be brought to oppose them. If they lay there for twelvemonths would they not become so foul in their bottoms that they must be sent home to this country to be docked? That is a very important question. If Mr. Henwood's ships can only cross the Atlantic—they are copper covered—they might remain there any extent of time.

Sir EDWARD BELCHER: They cannot be covered with copper.

Mr. HENWOOD: Yes, covered with copper.

Sir EDWARD BELCHER: Not, if covered with iron.

Mr. HENWOOD: The armour is sheathed with wood, and then covered with copper.

Mr. LAMPORT: I admit that chemical action would, to a certain extent, arise; but not so as to render it entirely impossible to use copper. Then we come to another question, the requirements of our ships engaged in commerce. What ships could we look to to defend our mercantile fleet? Suppose we were at war with any small country, the enemy could, if he chose, send to the United States and purchase such vessels as the "Alabama;" and what chance should we have with our present Navy to sweep them off the seas? I put it to you, whether we should not be very much in the same condition that the United States were when a single vessel, the "Alabama," was destroying or paralyzing the whole of her commercial fleet. Then, the typical ship of the future must combine these three qualities. She must be of light draught; must be capable of carrying a large amount of coal, and of going to sea, as a sea-going vessel, for purposes of aggression; must be swifter than anything afloat, be capable of overtaking any vessel that may be brought to compete with her; and this, in order to protect our commerce in every part of the world. If you can build a ship that can combine all these qualities, I say you will be building something which I, for one, do not contemplate as possible. If, on the other hand, we are driven to separate the three qualities into different classes of vessels, surely until this great question is solved, it is far better to take what things we have, and make the most of them. As Shakespeare says, "Better to bear the ills we have, than fly to others that we know not of." If we go to the expense of building enormous ships, such as we hear are intended to be built, we may find out afterwards that they do not answer their intended purpose; and in ten years hence they may be superseded by something better. Surely, it is wiser to use what we have before us than to lay out money in building vessels that may be practically useless.

Sir EDWARD BELCHER: It has always been contemplated that we should run in and blockade an enemy's shores. I am one of those who remember when we blockaded the whole of the French shores and the whole of the American shores; and what we did before, we can do again. And as long as we can build ships for foreign nations, I have the most perfect reliance upon our private yards to furnish us with ships of every description fit to attack an enemy, and to build them in one-half the time that they do now.

Mr. SCOTT TUCKER: I think our thanks are greatly due to Mr. Henwood for the suggestions he has made. I do not think he proposes, or attempts to propose, that which may be considered the best system for the Navy in general, but that which may enable us to make the best use of those vessels which are now rotting in our ports. With regard to an observation that fell from Sir Edward Belcher as to the "basket-work" structure of these vessels, those who know how hulls have been constructed since 1830 are aware that the framework of all timber-built vessels has been so chain-bolted that the upper works are almost as firm as a rock. In the South Kensington Museum there is the drawing of a vessel called the "Amethyst," which was so chain-bolted that, after being twenty-one days and nights on rocks, and having been floated off and taken into dock, her shear was found not to be altered an inch, so firmly was she chain-bolted. I believe the vessels now in our harbours are so firm and so solid that the weight, instead of being brought direct down on the keelson, might be so disposed on the superstructure or framework as to make those vessels, without doubt, very serviceable as convoys and other purposes, as temporary vessels during the time that proper turret-ships of the line are being constructed for the service of the country.

Mr. MACKIE, Assoc. I.C.E.: I should like to make one remark upon the structure proposed by Mr. Henwood. I think we are all very much indebted to Mr. Henwood for showing us a practical means of converting our present wooden line-of-battle ships. I do not propose to enter upon that question. But when I hear it said by Mr. Lamport that vessels must be kept on foreign stations in a state free from fouling, in order to be efficient for fighting purposes, and when I hear from Mr. Henwood that the bottoms of his ships are to be coppered, I do feel surprised that naval architects cannot, or will not, pay some slight attention to chemistry and electricity. It is utterly impossible for any iron ship to be sent to sea covered with copper, or with even a sheathing of wood to be covered with copper, and the iron not be deteriorated. If you put those two metals into an alkaline bath like sea-water, the iron must rapidly deteriorate. Some experiments have been tried with zinc sheathing. Zinc is the only metal that will not decompose iron in sea-water. I cannot see why copper should be preferred to zinc, or why zinc should not have a fair chance. Experiments with zinc have been instituted by Government, and why the results of those experiments should not have been made known, or why some practical experiments have not been tried with a view to the application of the zinc to iron ships, I know not. It is well known that the presence of copper in salt water produces a galvanic action, which is quite sufficient to destroy any iron in its immediate neighbourhood. The wash of the waves will produce this action: I have satisfied myself completely as to this by immersing copper plates entirely in salt water, when the action will go on by itself. Therefore, I cannot but notice the danger of putting copper on an iron ship.

Captain MONCRIEFF: In reference to Mr. Mackie's remarks, it has just occurred to me that there is a material difference between the vessels proposed by Mr. Henwood, and those where a thin coat of wood is interposed between the iron and the copper. By looking at the diagram it will at once be observed that the iron occupies a comparatively small portion of the outer part of the vessel under water; and that all the remainder of the bottom might be coated with copper. The copper might be kept at a considerable distance from any portion of the iron. I believe, at the same time, that electric action would go on to a certain extent. It is well known that even a chain dropped into the sea in the neighbourhood of a coppered vessel will show the effects of this action. I have myself observed this in yachting. In the present case, the iron is within very few feet of the surface; by heeling over the vessel it could be cleansed, and the destruction of so large a mass of iron would be so small that it might almost be overlooked. I have diffidence in expressing an opinion on this subject, but on looking at the diagrams, they at once suggest to my mind the possibility of using both iron and copper together.

The CHAIRMAN: Perhaps you will like to reply now, Mr. Henwood?

Mr. HENWOOD: The first question was about the poop and the forecastle. The poop and forecastle are merely for the accommodation of the Officers and crew, as a means of supporting the spar-deck and tying the two ends of the ship together. Those who know the construction of these ships are aware that all the timbers run up to the spar-deck, and bind the stem and stern of the ship together. There are various reasons for this mode of conversion, because when you cut down, as in the "Royal Sovereign," the whole stern would have to be pulled down and rebuilt up again. With regard to the legs of the tripods being in the way of firing, that is an objection. It is not a new objection; it is an objection that belongs to this system of tripod-masting in turret-ships. I do not see any way of overcoming it. The only way is to fire clear of it, if you cannot do that it must be fired away and come to grief. As to the protection of the men on the monitor-deck at sea, that deck would not be inhabited. The only protection I propose to put round it, are the stanchions. All the work of the ship will be done on the spar-deck, and the working of the sails; in fact, it will be at sea as if that deck did not exist, as far as working the ship is concerned. I think Sir Edward Belcher's remarks have been so thoroughly answered by Mr. Lamport that very little is left for me to say. But I am not sure whether Sir Edward knows that in these wooden ships, since the year 1825, the timbers are all solid in the bottom and bilges, 30 inches of solid wood. And I will correct any misconception in supposing that there is no increase of weight. I do make an increase of weight. But you will see the weight in

Table C is only 6,265 tons, whereas the weight of the "Ocean" is 6,600 tons. Well, she has performed good service, as I pointed out, in the voyage to China. She has no strengthening whatever, she is merely a cut down line-of-battle ship, with armour plates hung on the sides; whereas in this case I plate the whole of the deck and the side with 1½ inch iron plates, connecting both with a strong angle-iron so that I make that deck as strong, comparatively, as an iron-bound cask. Then, in addition to that part of the ship, which I mainly look to for strength, I have the additional tie of the spar-deck. I should remark that the hammock-berthing is formed of box girders, with plates running down at intervals, so that I get an enormous strength in the spar-deck.

The CHAIRMAN: Is this an iron deck here?

Mr. HENWOOD: Yes; the Monitor deck.

The CHAIRMAN: Does that tie the two sides together?

Mr. HENWOOD: That ties the two sides together.

Mr. LAMPORT: What is the present weight of the "Duncan?"

Mr. HENWOOD: The present weight of the "Duncan" is 5,950 tons. The weight of the "Duncan" converted is 315 tons more than the weight of the "Duncan" as a line-of-battle ship. (See foot note to Table C, page 189.)

Mr. SCOTT TUCKER: What weight of gun do you propose?

Mr. HENWOOD: 600-pounders when they are made. I have allowed for six 25-ton guns.

Captain BEAMISH, R.N.: Do you think the spar-deck will stand the firing of 600-pounders?

Mr. HENWOOD: I was going to make a remark about that. Some experiments have been made on the "Prince Albert" at Plymouth. The "Prince Albert" is an iron turret ship: the Admiralty built over her a very slight spar-deck. They fired her guns, with a bucket of water on the top of the spar-deck. The concussion merely shook the bucket of water, and spilt very little. The deck was very weak indeed. They have since put a larger deck, and made it stronger; and the result is so perfectly satisfactory to the Admiralty that I believe they have no fear at all about it. With regard to firing right ahead and right astern, of course that is obtained in the "Royal Sovereign," but is not obtained here. A ship is a compromise; and this converted ship is more of a compromise than a new ship. You sacrifice the right ahead fire that you have in the "Royal Sovereign;" but then you have the convenience of this poop and forecastle for the comfort of the crew, for catting the anchors, the hawse-pipes, and various other things. One thing compensates for another. With reference to Mr. Lamport's remarks about the typical ship of the future, I think I stated that there would be different classes of ships. There would be the ocean cruizer and the harbour defence vessel. But all this would have to be first determined by the Naval Officers. It is their place to say what is the engine of war they require, to perform the service which the country demands of them: then it is for us mechanicians to see what sort of engine we can construct to fulfil such conditions. Then, as to coppering iron plates, I know there is a good deal of objection to that; but I am not sure whether it would not be possible to sheathe the iron with zinc. Of course, in connection with copper, zinc would consume much more rapidly; but we might provide for that by bringing the zinc down lower and putting a thicker strake in. But that is quite an open question, which practice only can solve. I think these are all the objections that have been made.

Captain BURGESS: There is one question that I should like to ask, viz., what would the "Duncan," if sold for old material, fetch?

Mr. HENWOOD: As regards the sale of the ship, I believe the selling price would be £10,000.

Captain BURGESS: What is her tonnage?

Mr. HENWOOD: She is about 3,700 tons; the selling price would be about £10,000, including engines and everything on board. She cost about £200,000.

The CHAIRMAN: I am sure the meeting will join me in thanking Mr. Henwood for his lecture on a very important and interesting subject. I myself heartily wish that he may have an opportunity of trying one of these ships, for if he does not

succeed the first time, the nation will benefit by the trial. As to the typical ship of the future, there is an old story about a Jack of all trades. Now we must have various trades; that is to say, we must have inshore ships, and we must have sea-going ships. I do not think the requirements of one will answer the requirements of the other. But I think we shall at last get the best sort of ship if we go on making these trials; and as we have so much good material in our harbours, I will not say rotting, though I wish they would rot rather than that we should burn them in our fires. It has been a heart-breaking thing to Officers who have sailed in these ships, and who know them to be as fine ships as were ever built by the hand of man, to see them actually of no use at present, and to know that they are being burned in our fires in London. I cannot help thinking that something might be made of these ships; therefore I am grateful to Mr. Henwood for giving us his ideas on the subject of their conversion. I for one think there is a great deal that might be tried for the benefit of the country.

SMITH'S LIFE-SAVING-BEDS OR MATTRASSES.

Mr. Henry Smith exhibited one of these beds or mattrasses, and explained its construction and use as follows:—

The outer covering is of a strong waterproof material, the stuffing being of rye-straw.* It is 6 feet long, by 2 feet wide, and has life lines firmly attached to the sides. These beds can, of course, be made of smaller dimensions to suit ships' berths, sofas, &c..

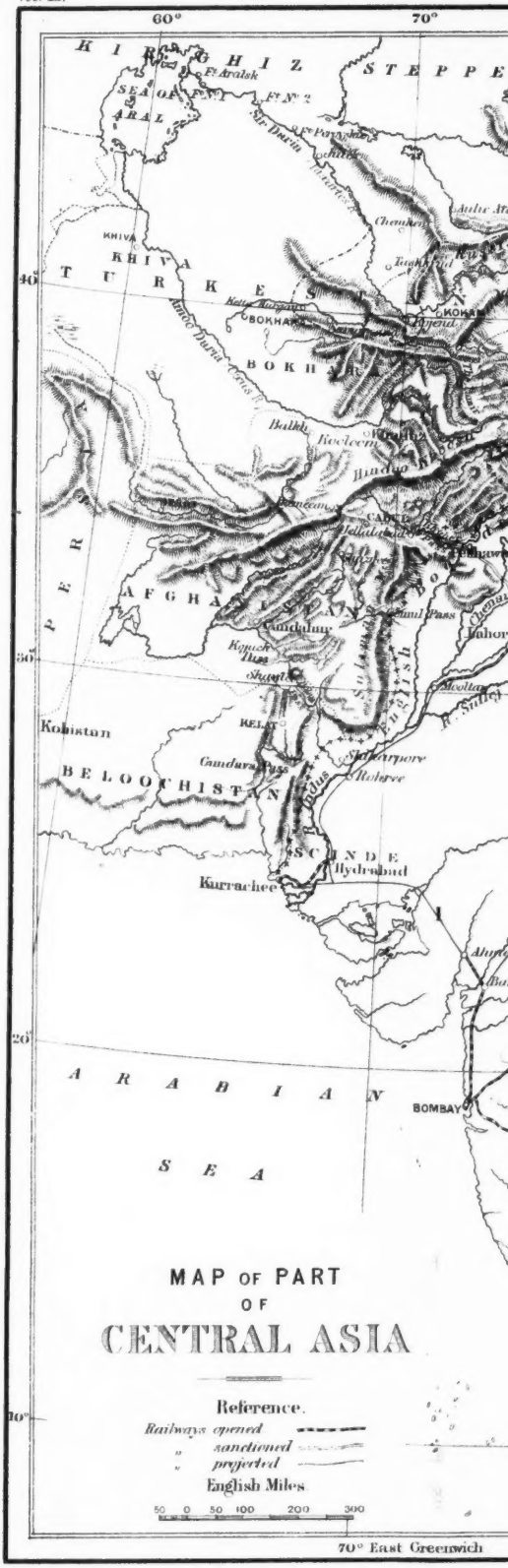
Their utility in case of shipwreck, fire, or collision at sea is obvious, the floating power of each bed being more than adequate to bear up a man, and will allow of his changing his position, and so give relief in the case of being in the water for any length of time. Any number of them can be fastened together, and thus form a raft of great buoyancy, and capable of sustaining an immense weight.

One great advantage of these beds is, that from their being filled with rye-straw, they will not sink, if pricked or torn, the air contained in the straw giving them great powers of floatation, whereas an accident of this kind in the case of an ordinary air-inflated bed, would prove fatal. Upon being thrown overboard the wind acting on the bed or mattrass will take it ashore; the tidal influence cannot retard its progress, this has been proved by practical experiments at Black Pool on the West Coast.

Several experiments have also been made on the Serpentine, off Chelsea pier, and also off London Bridge, to prove the power of floatation of these mattrasses. In one case, a man floated on one, his weight depressing the mattrass about 1 inch. In another, a mattrass supported six men in the water, who, by holding on to the sides, were enabled to keep their heads and shoulders above the surface.

My hope is that these mattrasses may gradually supersede those in present use in cabins and berths, and also the stuffed horse-hair bottoms of sofas, &c., on board ship. In the event of a wreck, every mattrass thrown overboard would form a life-buoy, and a number fastened together, a life-raft.

* Any material containing air can be substituted for rye-straw.—H. S.


60°
70°
40°
30°
20°
KIRGHIZ STEPPE
SEA OF ARAL
Ft Aralsk
Ft N° 2
Ft Perovskoi
Chemkend
KHIVA
KHIVA
TURKESTAN
BOKHARA
Bokhara
Balkh
Kooleem
Hindoo Koosh
Candahar
Jellalabad
Cabul
Ghuznee
Peshawur
AFGHANISTAN
Candahar
Khojuck Pass
Shawl
Kohistan
KELAT
Candahar Pass
BELOOCHISTAN
Sukkur
Shikarpore
Kurrachee
SCINDE
Hydrabad
Multan
Lahore
ARABIAN SEA
BOMBAY
PERSIA
MAP OF PART
OF
CENTRAL ASIA
Reference.
Railways opened
" sanctioned
" projected
English Miles
50 0 50 100 200 300
70° East Greenwich

Stanford's, Geog. Estab. London.

Evening Meeting.

Wednesday, April 14th, 1869.

MAJOR-GENERAL SIR H. C. RAWLINSON, K.C.B., F.R.S., in the Chair.

NAMES of MEMBERS who joined the Institution between the 5th and 14th April, 1869.

ANNUAL.

Ommanney, Frederick G., Esq., Navy Agent. 1*l.*
Fulton, John, Lieut.-Colonel late Indian Army. 1*l.*
Ardagh, J. C., Lieutenant, Royal Engineers. 1*l.*
Rowley, Charles J., Captain R.N. 1*l.*

THE NORTH-WEST FRONTIER OF INDIA.

By GEORGE CAMPBELL, Esq., Bengal Civil Service.

I DO not pretend to lay before you any new discoveries with regard to the geography of the countries which are the subject of this paper, or any very minute details, but I must begin by a reference to what I may call the broad practical features of the geography, and that I think, I may best and most briefly submit in a pictorial form; that is to say, I have constructed a coloured map* showing in a somewhat glaring style the features of the countries to the north-west of India.

It may be generally said that the whole of that portion of the globe lying between the interior of India and the frontier of Europe is characterized by extremes.

It is a region in which great plains alternate with very high mountains, the highest in the globe. On the north-west, within the limits of India, we have an enormous plain; beyond that, we have the prodigious mountain system, of which only a small portion can be considered to form part of India; then again we have another great plain in which flow the Oxus and Jaxartes, otherwise the Amor and Syr, and within which lies the great salt lake, called the Sea of Aral,

* It being impossible to re-produce the coloured maps referred to in the paper, a general map of part of Central Asia is prefixed for reference.—G. C.

where those rivers lose themselves. This plain reaches to the Caspian and the Ural Mountains. The country we know as Turkistan. On the other side of the mountains you have another great plain forming what was Chinese Tartary, and is now called Eastern Turkistan. More directly to the west, we have somewhat less gigantic but still very great mountain chains branching out from the main system, and again the smaller plains of Seistan and Khorassan.

The position of the enormous mass of elevated land expressively called by the Easterns "Bam-i-dunya," the "roof of the world," is sufficiently indicated for my purposes by the blackest colours in my map. You will observe that the most compact, and best defined portion of the mass may be said to lie between Kokan on one side, and Kashmere on the other, and it is to that portion that the term "roof of the world" has been applied. Kashmere itself, a mere valley lying between mountains 15,000 feet high on one side, and 25,000 on the other, is no terminus to the high land, which is in fact continued with an undiminished elevation far to the east towards the frontiers of China. I have only omitted to mark the elevation here to so great a breadth, because in these parts we know little of it beyond our own frontiers, and it is beyond the limits of my present subject.

It is the fashion to speak of these elevated portions of the earth as table lands; but I believe that to be a mistake. It certainly is so as respects all those parts which we know. The high lands of the earth almost invariably consist of a succession of ridges, and that is very markedly the case as respects the highlands of Central Asia to which I more particularly refer. We have but mountain beyond mountain, and ridge beyond ridge. Any route across them shows a series of constant and sudden variations of altitude. In respect to the lowest point of the passes one minimum seems as it were to be maintained, below which the ridge at no point descends. The highest peak yet measured—it has been supposed the highest in the world—is on the frontier of Nepal, about 29,000 feet; but it seems to be yet doubtful whether it may not yet be displaced by some portions of the second or interior range between India and Turkistan, called the "Karakorum," which we are now exploring, and where our surveyors have already measured as high as 28,278 feet. It may be said that in the whole length of the range, it can nowhere be crossed without ascending over and over again to a height little less than 20,000 feet. The traveller in fact passes through a succession of gaps in the higher ridges, the crest of the gaps or passes themselves being 18,000, 19,000, and 20,000 feet high. So far as we know, about 19,000 feet may be taken as the minimum height at which the range may be crossed. Between the ridges, the traveller dips several thousand feet lower, sometimes to tracts level by comparison, or it may be that he must descend to the deep gorge of the Indus, the bottom of which in the direct line between Kashmere and Yarkund is only some 7,000 feet above the sea.

From the "roof of the world" the "Hindoo Koosh" range stretches to the west. Of the first portion we have no measurements, and scarcely any knowledge. The passes have never been traversed by any one

but rare native travellers, and from their accounts, we may assume that their height and character does not differ materially from those of the main range. In the parallel of Cabool, we first come to more practicable passes. Hereabouts, are one or two gaps, the heights of which are as nearly as we have been able to ascertain about 15,000 feet. And a little farther east we have the famous pass of "Bamean," which is somewhat lower, and which has long been used for mercantile and military traffic.

Like all other routes across the mountains, this "Bamean" pass is really not one pass, but a succession of at least four passes, over as many successive ridges of nearly equal elevation. The highest pass in the route is entered as 12,480 feet in Walker's latest map, where another pass in the same route is put at 12,190 feet, and a third at 11,320 feet. For our purposes we may take the maximum heights of the road to be about 12,000 feet.

To the west of Bamean the mountains rise again. It is not very clear whether the reason is physical or political, or both combined, but at any rate, these mountains have not within historical times been open to any ordinary traffic, and it may be said, that west of the "Bamean route" there are no available passes from Turkistan, till you come to those leading to Herat.

Here the mountain chain, without disappearing, is much diminished in height. About Meshed, it seems to rise somewhat again, but for some distance on the east of Meshed, towards Herat, and again to the west of Meshed, towards the Caspian, the country is certainly less difficult, till we reach the higher ranges of Persia again. There is no cessation of the hilly country, but on either side of Meshed there are tracts through which the mounted Turkmans can and do ride in plundering forays into Persia; by which Herat may be approached; and by which occasional caravans travel.

Both east and west of Cabool, the Hindoo Koosh joins or approaches the high ranges forming the proper Affghan country. The mountains to the south of the gorge leading up to Cabool are 15,000 feet high, the outer range known as the "Solimanee" ranges from 10,000 to 12,000 feet; the routes farther to the west are throughout not less than from 7,000 to 8,000 feet; and the unknown country between, is no doubt very high and difficult. Still farther south in Belochistan, the hills are not quite so high, but are barren and inaccessible in the last degree. They are traversed by two or three passes, of which the "Bolan" is the easiest and most famous. It rises to a height of 6,000 feet, in a course of about 60 miles through a succession of defiles between Dadur and Quetta. Between Quetta and Candahar is a pass, 7,500 feet high, called the "Kojuck."

Not less important than the elevation, is another view of the physical geography, the supply of water; and I have depicted in green the tracts watered and habitable. From about the parallel of Lahore westwards and northwards, it may be said that all the way till we come to European limits, the rainfall is so scanty, that neither crops nor grass can be raised in any quantity, nor can human life be supported, except by artificial irrigation.

Interior India is well watered by the south-west monsoon, and the partial want of cultivation, there shown, is due to hills; till farther north, the supply failing, there is a scantiness of water. The monsoon of Eastern India, deflected by the Himalayas, comes from the south-east to the north-west, a rain-bearing current which gradually diminishes in volume, and hugs the face of the Himalayas. To this is due some fertile country immediately north of Lahore, but with this exception, the nearly rainless character which I have stated, applies not only to the Indian Desert, but also the greater part of the Punjab and Scinde, throughout which, cultivation is confined to the strips within reach of the great rivers.

In the other great plain of Central Asia, even these strips are wanting. It is no doubt due partly to physical, and partly to political causes, that there seems to be very little cultivation on the banks of the Amor and Syr, when they leave the hills and roll through the desert bordered by little but occasional brushwood and jungle. There are petty exceptions here and there; but that seems to be the general character of their course, except at one point about Khiva. There the Amor seems to have at one time altered its course, and there are facilities for irrigation in the Quasi-Delta between the old and new courses, which have given rise to the large Khivan oasis, watered from the Oxus itself.

With this exception, it may be said that cultivation is everywhere confined to the valleys in, or immediately under the hill-country where there are special facilities for artificial irrigation. It is a curious feature of the extreme aridity of the country, that while the greater rivers never reach the sea, the smaller streams never reach the larger ones, but are cut off and absorbed. If you examine the map, you will find this everywhere, a constant succession of streams pointing towards, and apparently designed by nature as feeders of the main rivers, but which never get so far. It is upon these smaller streams that the chief cultivation is found. The cultivated portion of the Khanat of Bokhara itself is not on the Oxus, but on one of those branches lopped off and separated from the parent stem, and is supplemented by another smaller tract on a smaller stream of the same kind. The Khokan territory is on the upper Syr, but it will be seen that it has great facilities for irrigation from the hill country on either side.

Khiva, Khokan, and Bokhara are the three well known oases of the Great Desert of Turkistan; all the rest may be said to be absolutely desert. In Eastern Turkistan again, which is equally desert, we have several oases formed by irrigation at the points where the streams issue from the mountains, Khoten, Yarkund, Kashgar, and Aksoo.

As respects the hilly country between the Deserts of India and Central Asia, I have tried to depict in green all the tracts which yield considerable supplies of food. In the Indian territory we have the great valley of Cashmere, and I have marked the narrow valley of the Indus, and that of its branch the Ghilgit river. We have a good deal of cultivation in the undulating sub-montane country within the salt range, the Rawul-Pindee district; and we have the

fine valley of Peshawur surrounded by the Affghan Mountains. Along the foot of the range we have some valleys similarly situated, Kohat and Bunnoo belonging to ourselves, and other small valleys in the hills belonging to the Affghans, and communicating with the plain at points where streams run from the hills. Further south there is a kind of bay in the mountain wall, and I believe a good deal of cultivation in Cutch Gundava belonging to the Beloch Khan of Khelat.

On the other side where the high ranges almost suddenly dip into the Turkistan plain, said even here to be no more than 500 feet above the sea, you have again a succession of valleys between the Spurs, Koondooz, Khulm, and Balk; Andko, Siripool, and Maimana, and the valley of the Murghab, a considerable river eventually lost in the sand.

On the Persian side you have some considerable valleys about Meshed, and where the great range slopes to the plain of Khorassan.

Within the hill country, you have, west of Peshawur, the Jalalabad valley lying low on the Cabul river; farther west the larger and higher valley of Cabul, and the fine well-watered tract at the foot of the higher ranges of the Hindoo Koosh. North of Peshawur, on the streams running from the snowy range to the Cabul river, you have two or three fine valleys, of which Swat and Kuner (called in its higher parts, Kashkar or Chitral), are the principal. Farther south you have a little cultivation about Quetta, and the Pisheen valley, and a fine tract about Candahar and the Helmund, the river running from the northern mountains southwards to the Desert of Seistan. Finally, you have the valley of the Harerood, in which is Herat.

It is impossible to depict the narrow glens which are scattered in nooks and corners throughout Affghanistan. They are no doubt numerous, and are often very pleasant smiling places; but their culturable area is extremely limited, and with respect to the whole country, this important fact may be broadly stated, that it does not produce a sufficiency of food for its own inhabitants, much less to export or supply food to strangers. Fine a race as the Affghans are, nature having so much restricted their culturable land, they are as a rule very poor, and a large proportion of them are obliged to eke out their subsistence by foreign service or trade. Grain seems to be generally exorbitantly dear at Cabul, as compared with the neighbouring countries; and the city would often be starved, if deprived of supplies from Peshawur and India. There is no such meat supply in the country, as to make up for the deficiency of grain. North-Eastern Affghanistan is certainly not a grazing country. The tribes thereabouts are singularly destitute of flocks and herds. Western Affghanistan is more pastoral, but so far as I know, there is no large exportable surplus produce. India draws neither sheep nor cattle in any large quantities from Affghanistan. The horses called Cabul horses, which are imported in some numbers, come, I understand, from the north-western valleys (which are not really Affghan), where grass seems to grow in great abundance at certain seasons, and where horses are said to thrive better than men. Fruit is almost the only edible exported from Affghanistan. In a great part of the country, dried mulberries are the main support of the population.

I repeat then that the country between the Indus and the Oxus is one in which food is deficient.

I now come to the people of the countries which I have described. I have not attempted to go into the difficult physical question of the gradual desiccation of this portion of the globe, the occurrence of which in some shape, I believe to be a matter of little doubt; but to enable us in any degree to realize the present situation, as compared with that in former history, I must very briefly notice the changes of population.

My belief is, that the world may be divided into two classes, people who are, and people who are not, patient of foreign dominion. Sometimes people, who by no means want military qualities, for example, the Punjab people, nevertheless submit quietly to an equitable foreign rule. To others, mere independence is a passion. More especially in mountainous countries, it appears that the people are either extremely quiet and amenable, or very much the reverse. This we see in a very marked degree in Northern India. Take first the Himalayas, the hill-country between the snow and the plains. It is the most precipitous and defensible in the world, and some of the hill men are among the best soldiers in India. Yet nowhere have we so quiet and easy a hold of the country, nowhere are fewer troops required; nowhere can an unarmed and unprotected European enjoy such safe and pleasant ease, as in the secluded hill-glens. Go but a little farther west to the Affghan country; it is really not so difficult as the Himalayas, and contains some more open valleys; but we know by experience that it requires all our military power to enter a single glen within a short distance of the plain country.

I believe the ancient Hindoos to have been probably a softer race than the more recent immigrants; they were, perhaps, more nearly allied to the modern Kashmerees. The ancient Persians, or to use a wider term, the Iranians, were a cognate race, and the Greek accounts of them sufficiently show that they were not very hardy. Both these races have always easily submitted to foreign conquerors. My point is, that in ancient times these softer races held the country between India or China and Europe, now occupied by more pugnacious tribes; and that in this, is to a great extent, the solution of the easier passage of those regions in former times.

It is certain that some hundred years ago, Hindoo races occupied the valleys of the Cabul river, and the southern slopes of the Hindoo Koosh. The Affghans have acquired most of that country within historical times. There seems to be some reason to suppose that the fertile tracts north of the "Karakorum range" were first colonized by Hindoos, and the name "Kashgar" may be a trace of the connection with the "Kashas" of Kashmere. A mass of evidence shows that the pure Persians were the ancient occupants not only of Khorassan and the north slopes of the Hindoo Koosh, but also of the whole of what we now call Turkistan, where they are still represented by the Persian-speaking Tadjiks and Sarts, a handsome, but soft and subject people. There ancient travellers and conquerors encountered people not diffi-

cult to deal with. I take the old distribution of races to have been somewhat as represented in this small race-map.

In modern times not only the people of Persia, and the Northern Hindoos have been hardened by an alloy of Turkish and Scythian blood, and the tribes of the upper Caucasus have been inured to war by long centuries of self-defence, but almost the whole of the country on either side has been occupied by two of the most independent races in the world, the most untameable, and least tolerant of foreign dominion, the Affghans and the Turkomans. The Affghans have multiplied and advanced over the whole of the country south of the Hindoo Koosh, as well as into the valleys to the east; the Turkomans have possessed themselves of the whole of the country on the other side, leaving the Persian races, the Tadjiks and Sarts in a minority in point of numbers, and in political position, absolutely subject. The country may now then be ethnologically described somewhat, as shown in this other map.

The Turkish races are now dominant in the country to the east also. In the farthest points of his conquests or influence beyond the Indus, the Maharajah of Kashmere has come among people who speak pure Turkish, as I myself ascertained by taking down their words. They have possession of the hill country, in which the Amor has its northern sources, and of the petty mountain states north of Balk and Kundooz.

Higher up on the northern slopes of the Hindoo Koosh, Persian-speaking tribes still prevail. On one side of the range seem to be tribes of Indian affinities, the Kaushkar people and Kaffirs, on the other hill Tadjiks of Budakshan. North of Cabul you have the same race in the hilly country. We must not omit notice of the very peculiar people who occupy the higher country west of Cabul, the Hazarahs and Eimaks, who, though they speak Persian, have in their features most palpable marks of a large share of Turanian blood, which they themselves attribute to the settlement of a Mongol colony by Chengis Khan. They have none of the brutal and savage character of the Turkomans; on the contrary, they are a pleasant, industrious, hardworking race, whom one would suppose to be more allied to Thibetan races. Many of them have lately come down to take service on our public works, where they are distinguished as first-rate navvies. Yet they are bold and well skilled in arms, for they have maintained their independence intact against Affghans, Turkomans, and all comers.

The hardy character of the Beloches to the south is well known. It is a curious circumstance that while in all southern and western India, Arab mercenaries have been entertained by the native powers, and even in the Beloch territory of Scinde, yet we learn from Palgrave and other recent travellers, that in the Arab territories in Arabia and Africa, the chiefs habitually entertain Beloch mercenaries to keep down their countrymen.

West of Meshed some Kurd colonies have been settled as a barrier against the Turkomans, and the dominant tribes of modern Persia are a mixed race much more warlike than the old Tadjiks and Sarts of the countries to the East.

In modern days then the whole of the countries between India and

northern Europe are occupied by races hardy and independent in the extreme.

It is very greatly to be regretted that since we have had so intimate a knowledge of Affghanistan, and there is so much scattered literature concerning it, the information has never been brought into one focus in any general description of the country and people later than that most admirable work, "Elphinstone's Cabul," the result of a visit to Peshawur in the early years of the century. Elphinstone, indeed, notwithstanding his limited opportunities, has in many respects occupied the ground so fully and so well, as hardly to leave room for another. But the political circumstances have entirely changed since his time, and we can hardly suppose that after years of British occupation there is not room for at least an enlarged and modernized work founded on the basis which Elphinstone has given us. I could wish that we had such a work before the personal knowledge of the Officers of the Affghan campaign is lost.

In Elphinstone's time there really was something of the nature of a Kingdom of Cabul. There was a ruler who claimed the character of King of a considerable country, and was possessed not only of Peshawur and the other valleys on the Indian frontier, but also of Kashmere and the neighbouring hills.

Now-a-days we speak of the country and kingdom of Affghanistan. It seems to be popularly supposed that there is something of the character of a King of that country, and that we may hope to promote the establishment of a strong and settled government of Affghanistan. How far there is a good deal of misapprehension in this idea, I would try briefly to explain.

"Affghanistan" is a mere English geographical term, hardly, if at all, known to the natives. Ethnologically there is certainly a large tract of country inhabited by a very marked race, properly called not Affghans, but Pathans. Politically speaking, the dominion of Cabul by no means includes the whole Pathan country.

At the very highest, the position of a Pathan King could only be compared to that of a King of Scotland in old times, and the state of affairs might be described as an exaggeration of Scotch affairs. The King was but the chief of one of many rival houses—a kind of chief among chiefs—obtaining a very precarious and limited allegiance from the other lowland chiefs, and a scarcely nominal allegiance from the highland clans. The principal difference as compared to Scotland would be, that the highlands of Affghanistan are in larger proportion and more inaccessible; the lowlands more scattered and difficult to rule; the people altogether more insubordinate: and just as a Scotch King never had much real power and authority till he acquired a great foreign dominion in England, and was thence able to bring money and influence to bear in Scotland, so a Pathan King has never occupied a strong position, except when he has had great foreign dominions, and could treat his own country as a mere nursery of followers and soldiers, to be petted and bribed into a sort of allegiance. In these days the ruler has been stripped of his foreign possessions, and even of some of the

Pathan lowland country. He does not pretend to the title of king; and curtailed as he is in power and in means to very narrow limits, it will not be difficult to understand the extreme difficulty of establishing anything like a strong government, except very partially during the dominance of some man of extraordinary personal vigour.

In truth, the Pathans are of all the people in this world the most democratic, the least subject to authority, the most independent. Physically they are one of the finest races created by God; and with them the spirit of freedom and independence amounts to a ruling passion. They are not only intolerant of foreign dominion, but yield scarcely any obedience to their own chiefs. They have none of the Celtic reverence, if such there really be, but rather the Saxon individuality. Elphinstone well describes their popular system of representation, the Jeergas of Clans, and the Sub-Jeergas of Sub-Clans, their allegiance to the community and not to the chief. To him I must refer you for particulars. It is to be feared, however, that even the popular assemblies exercise a very imperfect power. To a great degree, every man is a law to himself, and blood feuds, attended with great loss of life, are chronic among the people. Elphinstone explains their habits and manners, and the difference between the western and the eastern tribes; the former being more pastoral and perhaps also somewhat more amenable to rule; most of the latter purely agricultural, perhaps we might rather say horticultural, and democratic in the extreme.

It must be quite understood that these people are of that class of the human race which has an intense attachment to the land and to fixed property in the soil, as distinguished from the wandering tribal habits and claims of Turkomans, or nomadic Arabs. The difference in this respect between Pathans and Turkomans is as great as between Kabyle and Arab in Algeria. The two races have no sympathies, and nothing in common.

There is yet another distinction among the tribes of Eastern Affghanistan, which it is important to note. The pure Pathans south of Peshawur, with the Afreedees and other tribes of the Khyber, are a people without reverence, not only in politics but also in religion—a hard, energetic, practical people, without imagination, and without much moral sense. Although nominally Mahommedans, I believe that they will cut the throat of a true believer almost as cheap as that of any infidel. All their enthusiasm is political, not religious. But north of Peshawur a mixture of race has told largely on character. This is the country which the Pathans have acquired and colonized within historical times. In Swat and the neighbouring valleys they found an Indian people, whom I suppose to have been allied to the Kashmerees. To this day the Pathans are there a superior race, and there are still inferior people who are not called Pathans. The Pathans have been largely influenced by the blood and intellect of the subject people. The Euzofsies, and other tribes to the north, have thus acquired much of the imagination and some of the reverence of those early Aryan races. They have priests, even pay a sort of tithes to priestly chiefs, of whom the Akhoond of Swat is the most famous.

They are somewhat more polished than their rougher brethren, and are really zealous Mahommedans, sometimes even fanatics. An aristocracy, with serfs to do the inferior work, they are quite equal to the pure Pathans as soldiers. I believe that it is from these clans that the most numerous Pathan colonists in India have been supplied. It is among them that the zealous Indian Wahabees, who have not cared to live under our rule, have found a scanty and not very hospitable refuge (the other tribes would have stripped them of every farthing), and it was against them only, that our last considerable campaign was directed.

In the days of Mahmood of Ghuznee, and the early Mahommedan conquerors, the Pathans had scarcely got so far to the north-east as Cabul. The founders of the early Indian dynasties first established themselves in Ghuznee and Cabul, and drawing the Pathans along with themselves, became, in fact, identified with them; so that the early Mahommedan Empire of Delhi was really a Pathan rule, and eventually became so avowedly.

Again, the Mogul power was first established in Cabul. I do not know whether the word Mogul is really "Mongol." By the people themselves it is applied, not to Mongols, but to the Persian speakers, who form a large section of the inhabitants of Cabul, as distinguished from Pushtoo speakers. There certainly was no considerable Mongol immigration into India. The number of people calling themselves Moguls is few, and there is not the slightest trace of Mongol feature. In fact, the Mogul dynasty too became, to a great degree, intimately connected with Affghanistan, and the Emperors maintained a suzerainty over that country by means of the wealth of India.

To the west, the Pathans have had various relations with Persia, and in the eighteenth century, during the decline of the Mogul power, these relations became very intimate. Early in the century, the western Pathans overrun Persia, and ruled there. Then Nadir Shah turned the tables and conquered them. On his death, Ahmed Shah Dooranee founded the Affghan dynasty, which in some sense subsisted to our day. This dynasty acquired from the declining Mogul Emperors, Kashmere and the greater part of the Punjab, and for a time protected the Moguls against the Mahrattas. When this Dooranee dynasty became distracted and weak, Runjeet Sing and the Sikhs were rising to power. They expelled the Pathans not only from the Punjab, but eventually from Kashmere also, and even from the Pathan submontane valleys, Peshawur, and the rest of the Trans Indus country. Meantime the descendants of Ahmed Shah had fallen in their own country, and remained exiles, except for the short time when our expedition galvanized into artificial life, the fallen dynasty. Dost Mahommed, Chief of the Barukzie clan, rose to a certain power, and wielded it by personal energy, but claimed no higher title than that of "Ameer," or Chief. We succeeded to the position on the frontier conquered by the Sikhs. Finally, Dost Mahommed dying, a disputed succession followed, as a matter of course. Hence the present situation.

I have alluded to the distinction between eastern and western Pathans. At the very utmost the present dynasty can only be described as chiefs of the Western Pathans. Over the eastern tribes they have no more authority than has the Lord Mayor of London. Even over the west they have a very imperfect hold. The proper Pathan country extends to the neighbourhood of Herat; and not only as a question of political arrangement, but also as one of nationality, Herat and the country about it, belong more properly to Affghanistan than to Persia. Yet it is so distant from Cabul, and so separated by the independent Hazareh country, that the ruler of Cabul has generally not been able to hold Herat also; and the latter place was throughout Dost Mahommed's rule held independently by another Chief, a member of the deposed royal family. Even Candahar was not under Dost Mahommed's rule till the latter years of his life.

Thus, then, Peshawur and the Derajat being cut off on one side, and Herat being a very uncertain possession on the other, the present dynasty, even supposing them to be united under one head, are almost confined to Cabul and Candahar, and such nominal allegiance as they have from some of the western tribes. On the east there remains to them little more than two or three small valleys, insecurely held. Over Swat and the valleys to the north, the Ameer has no more authority than over the hill tribes to the south. With so limited resources, it is impossible that the Chief can maintain a large army or considerable state; and he must be a genius indeed who so situated can control and rule over such a people as the Pathans.

I have still to notice the valleys at the northern foot of the Hindoo-Koosh. Tracts so situated must always be an object of contention between the powers in the plains below and those in the hills above. The latter have greater facilities for disturbing the quiet possession of the tenants below, and the powers being anything like equal, it will generally be found that the sub-montane valleys go with the hills. Accordingly, the Pathans long possessed the valleys, both on the side of Peshawur and on that of Balk. When they were weak and divided among themselves, they lost them to the Sikhs on one side, to the Turkomans on the other. When Dost Mahommed was firmly established, he succeeded in re-annexing Balk and Koondooz, and those tracts are still under Pathan rule. The population consists partly of the original Persian-speakers, partly of Affghan colonists, and partly of Turkish colonists. The Pathans seem to have settled in large numbers, and may now be considered to be the dominant race.

In the valleys to the west, a Turkoman population preponderates. They form a succession of small Turkoman states, and the Pathans have never succeeded in establishing power there.

I was one of those who thought that it might have been better to have made the Upper Indus our boundary line. Rivers are seldom boundaries of races, but in this case it happens that it is so. On this side to Attock we have Indians—beyond the Indus, Pathans. The Peshawur valley and other sub-montane tracts are occupied by portions of the same tribes which hold the adjoining hills. I thought that by stopping at the Indus, we should escape constant collisions with the

frontier tribes, and that the possession of the sub-montane valleys would both give means to the Cabul ruler, and would make him, as it were, vulnerable on the side of India, since he would hold some of his most valuable possessions open to be seized by us at any moment. On the other hand, it may be that without control over the hill tribes, he could hardly have held with profit, lands east of the Khyber; and our possession of Peshawur, Kohat, &c., has had an important political result, which may possibly be beneficial. It has brought us into extremely intimate relations with the Eastern Pathan tribes, whose geographical and commercial relations are much more with the East than with the West. Not only do large numbers of them serve us as soldiers, but they make what is to them great profit by trafficking with us. They have the freest access to our territories and cantonments; and being by no means a shy or modest or prejudiced people, they avail themselves of it to the very utmost, and never neglect an opportunity where they can, honestly or dishonestly, of earning a penny, or of stealing a penny's worth. In fact with some of the tribes, intimacy amounts to familiarity. On a market day at Peshawur, crowds of the independent Pathans may be seen making themselves thoroughly at home, and a stranger, ambitious of an interview with a noted hero of the Khyber, may be gratified on very moderate terms. Yet it is a curiously one-sided familiarity. They take advantage of all the freedom that we offer, but no European dare show his nose within their borders. This is from no personal prejudice or dislike, but simply from their passionate love of independence and extreme jealousy lest the secrets of their hills should be spied out by the race, whose genius for absorption they dread.

The ordinary punishment for minor offences committed by any hill tribe, is to blockade it, and prohibit the entry into our territory, of the people of the offending clan. More serious cause of armed collision we occasionally have, and always must have—it is a necessity of the situation—but it seems generally to result in a good-humoured kind of fighting, which can be amicably ended when terms are arranged. We never have, and scarcely can have, any general war with the tribes—they are so entirely without union among themselves.

Practically then, it may be said that the relations of the Eastern tribes are with us and not with the Ameer of Cabul. It would be madness to touch their independence, but we have unlimited facilities for negotiating with them, bribing them, and taking them into our pay when occasion requires.

This, however, must always be borne in mind, that the Pathans are a thoroughly practical people, in whom necessity and their peculiar political position has sharpened the wits and developed social astuteness to a remarkable degree. It is generally said by our frontier Officers, that for bold disregard of truth and unblushing fiction in the law courts, a Hindoo is a child compared to a Pathan. Make it worth their while, and we may get from them money's worth. But it is not for an instant to be supposed that we can hoodwink them, *diplomatize* them, gain their favour or affection, or secure them in any way, except for value had and received. They are terrible talkers, and always

ready to negotiate and hold forth in the most plausible manner; but you may always be quite sure that they are hard set on getting something out of you. They need money very much. We have a great reputation as good subsidizers. In this view every Pathan Chief is, above all things, anxious to be a friend of the English. The difficulty is, that they cannot control their people, and bargains fall through because the tribes cannot agree among themselves about the division of money received. The Khyber Pass has been closed for years on this account, because the Afreedees cannot agree among themselves; and the communication between Peshawur and Cabul is chiefly through the hills of the Momunds—a more amenable tribe, who have relations with both Governments.

The Beloches to the south are a different people. They are equally or even more predatory, being less attached to the soil, and roam more as wandering robbers; but they are said to be a good deal more amenable to the authority of their tribal Chiefs.

I cannot pretend to give many particulars regarding Turkistan and Tartary. My consolation is, that so far as I can discover, no one else can give reliable details of those countries. We have, from the descriptions of Vambery and others, excellent accounts of the general character of the country and people. But what I mean is, that we have nothing that can be called statistics, or any approach to statistics, giving us any idea of the real extent of cultivated area or the population of the oases which exist in this great desert tract. I find the population of one of the largest Khanats variously estimated by the best authorities at from half a million to three millions. My own impression is, that much of what is said of extent, populousness, fertility, and production, is due to contrast with the wretched desert around, and that *positively* most of the oases are very petty countries. Still the settled tracts of the three well known Khanats, Khokan, Khiva, and Bokhara are, no doubt, in some sense considerable. The oases of Chinese Tartary I suspect to be less considerable. The valleys occupied by the Turkomans on the northern face of the Hindoo-Koosh are certainly but small tracts, and produce more grass than grain.

In the population, a distinction seems to be drawn, in common parlance, between the Turkomans—the wild and utterly untamed robber tribes, who roam over the deserts—and the Uzbegs, the latest conquerors, who now occupy all the settled tracts, and claim a nominal allegiance from the wilder tribes. The fact, however, seems to be, that they are all of the same Turanian race, the Uzbegs being merely the dominant, and, in some sense, more civilized tribe. Of the whole race it cannot too often be repeated, that they seem to be the most brutal, bloody, untameable, slave-dealers on the face of the earth. The word Cossak, or Khazak, is simply Persian for "thief," and widely applied to all the Central Asian tribes of Turkoman blood.

I have used the term "Turkoman" generically to include the Uzbegs. The Chiefs of the Khanats, and the people of the valleys adjoining Affghanistan are Uzbegs, not Turkomans proper.

The Sarts and Tadjiks are now more the subject race in towns and

cities than a politically important section of the general population. I gather that most of the rural agriculture of the settled Khanats is in the hands of the Uzbegs.

The plains and oases of Turkistan are more or less, in some sense, divided among the three great Khanats. In the hills north of the Amor are some chiefs, practically quite independent, and the same position is held by the Chiefs settled on the skirts of the Hindoo-Koosh.

Since the Chinese yoke has been thrown off Western Tartary, the oases there are also ruled over by separate Khans.

My object hitherto has been rather to state facts than to enter into political argument, but I would like to be allowed briefly to recapitulate what I may call a few political facts.

First, with respect to Eastern Turkistan. I venture, once for all, very briefly, to assert, that we might put political questions aside altogether, and that merely as a question of plain physical geography, any hostile movement towards India from that quarter is simply impossible; that, in fact, the very idea is utterly absurd and out of the question. I may quote Sir Henry Rawlinson, as a great authority, in that view. That a modern Army should march three or four hundred miles over the highest portions of the globe, over a vast unproductive and almost inaccessible region, ranging from 15,000 to 21,000 feet high (without counting the higher mountains), is a thing not to be thought of till aerial machines are perfected. I dismiss the idea altogether.

Undoubtedly, for the purposes of trade between British India and Eastern Turkistan, it is most desirable that the direct route should, if possible, be opened up, and great credit is due to the Officers who have pushed the matter. The advantages of the route are manifest, both in an immense saving of distance as compared with the route by Cabul and Khokan, and in the fact that the political obstacles to trade, so glaring in the other route, do not exist, if we can only get over the physical difficulties of the road, which are enormous.

I trust that the transit will be accomplished, and that a very beneficial local trade, both in the shawl wool of the high regions, and with the countries beyond, will spring up.

In a political point of view, I should say that so far as our interests are concerned, we might highly applaud the occupation of Eastern Turkistan by the Russians, if they should push on in that direction. It would occupy their hands, and keep them away from us, placing them perfectly safe on the other side of the wall as it were, and all on the way to China, instead of to India. Even their tariffs would hardly treat our trade worse than those of barbarous native princes; and if the road were opened to travellers, it would be a pleasant diversion of the monotony of Indian life to run over and visit Russian settlements in Yarkund and Khoten.

The question of the approach to India by the Caspian and Khorassan has been so fully discussed for the last thirty years, that I shall say little about it. Russia is in that direction no nearer to us than

before; and in any question of this kind, the great thing is to keep before us simple figures of distance and height, and to bear in mind relative magnitudes.

Astrabad at the south-east corner of the Caspian, is as nearly as may be, 1,250 miles from the Indus; say from the shore of the Caspian, by Meshed to Herat, 500 miles—Herat to Candahar, 370 miles—Candahar to Shikarpore in Scinde, 378 miles. Short of being absolutely impassable to Armies (like the routes 20,000 feet high), the whole road is one of the most uncomfortable and impracticable in the world, being a succession of deserts and mountain passes—the seats of predatory tribes—with the rare cultivated tracts which you see, hundreds of miles apart. Most of you are better qualified than I am to judge what would be the difficulties of such a march of 1,250 miles—somewhere I suppose about the distance from Paris to St. Petersburgh—ending in by far the most disagreeable and least promising part of India. After all, too, the Caspian is not the ocean with all the resources of ocean steamers; we found it a pretty serious undertaking to land a few thousand men on the coast of Abyssinia; how much more difficult to land and supply a great Army on the southern shore of the Caspian, with only the naval resources of the Caspian.

The routes from the Caspian to the Khanats seem to have been for the present nearly abandoned by the Russians. The lines of wells marked on the maps notwithstanding, there is practically for military purposes a nearly waterless and utterly desert tract of some 500 miles between the Caspian and Khiva, and the latest papers seem to treat the route as impracticable for armies, although there are projects for reviving it, and creating a communication with Georgia and the Caucasus.

We come then to the line of advance by the Syr Darya, by which the Russians have lately pushed forward, and where the present interest of the question lies. It will be seen, that by this route little would be gained on the way to Bokhara and Khokan by using the Sea of Aral. In truth that seems to be a most uncomfortable sea, with utterly desert, shallow and sandy shores, yet stormy, so that shallow river boats cannot venture on it. The great rivers exhausted in their course through the desert, enter it by very shallow channels, giving not more than at most two or three feet of water. Any communications by the Sea of Aral are but supplementary to the land route, which the Russians really use. They have now, I believe, a force of about 13,000 men in all in Turkistan, and the difficulties of getting their troops there, may be judged from the following sentence taken from the official report of General Romanoffski. "*At present it takes two years to march a body of troops from the Volga to Turkistan.*" Only consider that, to say nothing of the route from Turkistan to India!

I would describe the situation somewhat thus:—In the middle of the last century we had not advanced in India beyond the neighbourhood of Calcutta, the Russians had not advanced far beyond Orenburgh and Petropaulosk. Taking the Hindoo-Koosh mountain system as the dividing barrier, Calcutta and Orenburgh are about equidistant from the foot of the mountains on either side, say

about 1,400 miles from Calcutta to Peshawur, and the same distance from Orenburgh to Balk and Khulm. We may take India and the countries on the other side to be also, in a rough way, about equal areas. But the difference is, that India is a fertile and well-watered country, inhabited by a race singularly patient of foreign rule, while the other is the most desert country on the earth, inhabited by the most intractable of human creatures. Consequently, it has happened, that in the course of a hundred years, we have occupied the whole of India, and not only occupied it, but established a complete and settled dominion there. We have made a network of railways through our dominions. Already two lines from either coast are all but completed as far as Lahore, a great part of a third line is constructed, and the missing link will probably soon follow; also a fourth line by way of Baroda. The continuation from Lahore to Peshawur is undertaken, engineers and materials have been dispatched. But the Russians contending with much greater difficulties, have in the same period made much slower progress. They have not occupied half of the country which lay before them; only of late years have they established themselves on the upper Syr, and come into collision with the chiefs beyond. Real roads or railways in any part of those regions they have scarcely yet dreamt of. They have but established caravan routes in the Desert, with halting places, along which caravans and small bodies of troops are painfully pushed, in two years' marches, as I have shown. As one swallow does not make a summer, so one successful expedition does not subjugate such a country; we must not jump to that conclusion, even if their troops advance further than they yet have. Supposing that the Russians were fully, firmly, and finally established in the whole country North of the Hindoo-Koosh, we should still be separated by a barrier say six to eight times as great as the Alpine barrier between France and Italy, a succession of mountain ranges more than twice as high, and three or four times as broad. The distance from Balk to Peshawur is 470 miles, the heights to be surmounted upwards of 12,000 feet; that distance over such a country might be enough to keep apart any two peoples, unless they are very desperately anxious to fight.

But this is looking into a far distant future. How long will it take Russia to settle herself in Turkistan? How much will it cost her? Is she able?—is she willing to incur the enormous cost? Supposing that she can, and does do so, the country will not be a second British India, but at best a sort of exaggeration of Algeria, a country infinitely more inaccessible to Russia than is Algeria, lying at the very door of France, many times the size of Algeria, much more desert, inhabited by more savage and untameable races. The thing is not to be done, except at an enormous expense. At present Russia can hardly find money for necessary works; where is she to get it for so vast an undertaking? And is the chance of what may come after, worth such cost to her, if she could get the money? Modern wars against civilized powers are not now conducted by mere hordes rushing down to conquer; every day, war becomes more and more a question of money and material. I take it, that in any view, it is totally im-

possible that Russia should attempt an invasion of India, till she has settled herself in Turkistan, as we are settled in India; till she has made railways to Bokhara and Balk, as we have to Lahore and Peshawur. If she attempts that, I will give her at a moderate computation fifty years to do it. But what may not happen before it is done? The proper Sclave races may hive off, and Russia be dismembered. We may abandon India, or it may be conquered by the great Australian Empire of the South. If we both subsist as great powers, why then, in the time of our grandchildren, the question may give rise to some diplomacy and anxiety. The Affghans may make a great deal of money out of both powers, putting themselves up to the highest bidder; but after all, there will still be the mountains between, and the power attempting to cross them, will be at an enormous disadvantage.

Take the present situation; it is at least 1,000 miles, as the crow flies, from Orenburgh to Bokhara—by road it must be considerably more—through an unmitigated desert almost the whole way. It is, of course, still farther from the Volga, the real basis of Russian advance. If the Khokan oasis be taken en route the distance will be considerably longer. From Bokhara to Peshawur the distance is 760 miles, and what are the practical difficulties of that route may be judged from the fact that under the most grievous provocation which a great nation could endure, the barbarous imprisonment and murder of our accredited Officers, we were unable to make any attempt to reach the Khan of Bokhara. Thus we have from Orenburgh to Peshawur a distance of at least 1,800 miles, for a practicable route we may say 2,000, or from Russia in Europe 2,500 miles, over horrid deserts, mountain gorges, and passes fully 12,000 feet high. Just realise what a pass of 12,000 feet is. It is all very well to talk of the "Bameean Pass" as practicable for artillery, because on some occasions one or two guns have been dragged across by mere manual labour of thousands of men. Ferrier says that Nader Shah took his artillery over, but the proof of it does not say much for the route, viz., that one of the guns is to be seen there to the present day, stuck on the road! Vambery tells us that for trade, the road is not much used on account of the difficulties of the Hindoo-Koosh. The pass is well called the "Dand skikan"—the "tooth breaker." It is only passable from June to the beginning of November. Consider what would be required to convey a modern park of artillery and all its material over a succession of passes *twice* the height of the Simplon, and for upwards of 400 miles of such roadless ground. Even if it be possible, what would it cost to march an Army from the Volga to Peshawur? What did it cost us with every possible facility and means of sea transport, with no enemy on the route, and a country not half so high and difficult as the Hindoo Koosh, to place some 3,000 men in line at Magdala, something over 300 miles from the sea-coast? How much more would it cost to march a much larger Army so much greater a distance, in so much more difficult a country, held by tribes whose profession is plunder? I do not believe that the thing is to be thought of in our day. Even Orenburgh is not yet connected with Russia proper by a long way.

In truth, the efforts of Russia, the systems of railways on which she is engaged, are not directed to the east but to the south. She is, I believe, not working in the direction of Orenburgh, but is concentrating her strength in the interior, and directing it by lines of rail towards the Black Sea—it may be towards Constantinople. If she has still any such designs it might probably well suit her that we should alarm ourselves about the East. By betraying, as it were, a raw place in that direction, a sensitive place where we can easily be made to wince, we are but playing her game. And still more by the continual repetition of these alarms, we are ourselves creating in the native Indian mind that very belief in Russia which we deprecate.

My object has been, as I have said, to submit broad, simple, and uncontested facts, and I do think that the mere realization of the most prominent facts and figures, the number of miles which divide us from the Russian power, the height of the mountains, the character of the country and people, may well allay alarms, and satisfy us that we may adjourn the Russo-Indian question for the possible consideration of the next generation, or the generation after that.

All this, moreover, is on the supposition of possible unfriendly designs on the part of Russia. It is well to take into account the most unfavourable contingency, but I had very great pleasure in listening to the important communication made the other day by Sir Roderick Murchison, in this theatre, that the Emperor had pledged himself to harbour no designs against our eastern possessions, and not to interfere in the politics of Affghanistan. I admire the friendliness of that declaration, and I also admire its good sense, for I am sure that nothing will be so beneficial both to the Russians and to ourselves as a good understanding, which will obviate the chance of both being victimized and bled by the Affghans, and prevent the abuse, by the disaffected on either side, of rumours regarding the proceedings and projects of the other. Especially must we be careful of receiving stories of Russian proceedings from the Affghans, the very people whose interest it is to magnify everything of the kind; and it is because all our Indian news of Central Asia comes through this channel that it is little to be relied on.

It would not be desirable that I should say much of our relations with the Ameer Sher Allee, of which we have no complete knowledge. I do not doubt that the Ameer is a very excellent Affghan chief, and very worthy of our friendship. As respects, however, any great degree of intimacy with him, the extreme instability of everything in Affghan politics must always be borne in mind, and this, too, which I have explained, that the Ameer's dominions really scarcely march with ours at all: he is merely a power near but not adjoining us, with whom we may well cultivate a friendly commerce and acquaintance. In my view, to send a European agent to Cabul would be undesirable for two reasons; first, that his life would not be safe, and we might by the act of some discontented individual become involved in a hostility especially to be deprecated; and, second, that if the thing went on smoothly it would still be putting our head into the lion's mouth; our agent would be considered by every chief in Central

Asia fair game to squeeze for money, and all who did not get it, would be aggrieved and disgusted.

My idea would rather be, that from our own borders we should cultivate general relations of friendliness; that we should make it thoroughly apparent that beyond those borders no one has reason to fear our aggression or interference; and above all things, that we should convince the Mahommedans of our own districts, by our practice and our manners, that we have no other desire than to cherish them as good subjects of the Crown, and that we shall never permit that political or religious prejudice against them should in the slightest degree actuate or colour our conduct.

The CHAIRMAN: After the very interesting paper which you have heard read, probably some gentlemen may be desirous of offering observations or of addressing questions to Mr. Campbell. As time presses, I must request any gentleman who may rise to condense his observations as much as possible. I say these few words in order to invite discussion. I see a gentleman present who has an extensive acquaintance with the subject, the meeting would be very desirous of hearing any observations he may think it desirable to offer, Sir Charles Wingfield?

Sir CHARLES WINGFIELD, M.P.: I really do not think I can enlighten the meeting at all, and what I have to say on the question I had better, probably, reserve for a future occasion, when the question may come before Parliament. Unfortunately I have not heard the whole of Mr. Campbell's paper, as I have only just come into the room. There is one point, however, upon which I should like to get the opinion of people who are much better informed than myself. Without apprehending any acts of hostility on the part of Russia, suppose that a demonstration should be made against British India, I should like to have the opinion of people more conversant with military matters than myself, what would be our strongest line of defence; whether we should confine ourselves to occupying the mouths of the passes on our side of the mountains, or should we cross the mountains and occupy the entrance of the passes on the side of Affghanistan?

General Sir VINCENT EYRE, K.C.S.I.: I am not prepared to enter fully into the question raised by Sir Charles Wingfield, but looking at that map I cannot help thinking that the view taken by Count Nesselrode was a very accurate one; that it is a very ugly looking map, that the country which is there represented, and still more as it really exists, is a very formidable barrier between India and Turkistan, and that the Emperor of Russia is a very wise man in what he has recently stated as his intended pacific policy. I do not believe that any wise man, placed as the Emperor of Russia is, with very great responsibilities, looking at that map, and still more looking at that country as I have seen a great portion of it, would undertake to hurl an Army against such a force as exists to meet him in British India. With regard to the points mooted by Sir Charles Wingfield, I think there can be no question that, although, no doubt, we have a very strong barrier in the river Indus itself, with the means which we can bring to bear to strengthen it in the weakest points, it would, nevertheless, be the duty of any British General commanding the frontier, to occupy the passes beyond. I believe those passes to be exceedingly strong and defensible with comparatively small bodies of men. I hope that the negotiations which have recently taken place with the Ameer of Cabul may facilitate the placing of those passes more at our disposal in the hour of need. I am not aware to what extent these negotiations have been carried on. As it has been stated by Mr. Campbell in his able lecture, we know that the tribes inhabiting those passes are in a very great measure independent of the Ameer of Cabul, to such an extent that it was stated lately that on his visit to our territory he was obliged to pay black mail himself in order to get through the Khyber Pass. I believe the chiefs and tribes of those passes are quite open to negotiations, and there would be no difficulty whatever, if ever such a crisis arrived, in our obtaining a sufficient hold of them to oppose an efficient barrier to any force that might attack us.

Mr. WYLLIE: I desire very cordially to concur in the remarks which have fallen from Mr. Campbell, as to the want of credibility which attaches to statements coming to us from India with reference to the progress of Russia. They are, as Mr. Campbell says, entirely derived from Affghan sources, and Affghans, as Mr. Campbell says, have an obvious interest in making the advance of Russia as formidable in our eyes as they can. There is another point which Mr. Campbell brought forward, I think very well, namely, the parallel which he drew between Scotland in former days, and Affghanistan up to a recent date, and even up to the present time. The country contains a variety of independent tribes, and the head of the principal tribe holds a very loose and undefined sway over even his own tribe, and to a still greater degree are the other tribes independent of his control. On the other hand I may mention a matter to which I think Mr. Campbell might perhaps have accorded more prominent mention, that is, the politicians who do enlarge upon the dangers to our Indian empire by Russian progress, speak of the advance by Herat through Persian territory, and of the great danger that might accrue to us from any offensive alliance between Russia and Persia. I should have been glad, therefore, to have heard Mr. Campbell ventilate the arguments connected with the Persian route. Indeed, as regards the other routes referred to by Mr. Campbell, it is generally acknowledged that any military movement by way of Balkh, Bameean, and Cabul, could only be of effect if conducted in concert with greater operations from Persia and the Caspian through Herat; and Sir Henry Rawlinson, from whose lips every word is of the utmost importance, has long ago dissipated any fear of danger to us, however small or remote, by way of Changchenmo or any other pass from Eastern Turkistan. Lastly, Mr. Campbell appears to me to take too seriously the declaration made by Sir Roderick Murchison the other day as to the pacific intentions of the Emperor of Russia. I doubt very much, indeed, whether the Emperor of Russia is in a better position than ourselves to forswear for ever, under all possible circumstances, any attempt to interfere with the independence of Affghanistan. It is very courteous and diplomatic language on the part of the Emperor of Russia. I am very glad to hear it, and I do not at all question its sincerity, but it is a declaration to which I can not, for practical purposes, attach the slightest value.

Mr. RIDDELL: I do not think those who fear a direct attack on India by Russia have any sound reason for their alarm, but those who have lived in India, especially those who have travelled over the length and breadth of the country, as I have often done, must be fully aware that there is a general feeling of uncertainty prevailing among the native population as to the permanence of our rule in India. Any attack by Russia or Persia, or any other nation, I will not say Russia, because I do not believe that Russia would attempt anything of the kind, or if she did, that we should be beaten by her, but any nation that seriously threatened us upon our northern or western frontier, would excite in India a state of feeling which would cost us many millions to repress, and which it is well worth our while to spend hundreds of thousands of pounds to prevent. Therefore, I think the Government have very wisely, at this moment, determined to subsidize, or if subsidize is a phrase which one ought not to use, to induce the Ameer of Cabul to be our friend, and to listen rather to our blandishments than to those which may be used by powers more to the west. With respect to the question, whether an invading Army, if it is not resisted by us, could penetrate through the Suliman range, and through those ranges which border our frontier on the west from Peshawur to Scinde, I think those who know those parts, and who have questioned merchants who annually traverse the passes, can have no doubt whatever that unless we are prepared to resist it on the western side of the Suliman range, an Army could debouch on the plains of India, and be ready to attack us on our frontier there, and certainly with more chances of success than if we held the passes and crest of the Suliman range. Never having been there, I cannot pretend to speak from personal knowledge, but from information which I have acquired from merchants, I believe I may say that between Peshawur and Shikapore, there is not forty miles of our frontier which could not be penetrated with perfect ease by an Army with guns, with the whole of its ammunition, with its whole force, provided there was no opposition in the mountains themselves. The question then is, is it cheaper and better for us to make friends with the tribes on

the west, than to remain sulkily and sullenly within our own boundaries, and say to the tribes who are semi-independent, "Do as you please, we will not assist you, we will not help you. If an enemy comes you may assist him, but we in the meantime during peace will not assist you." That appears to me the question of the present day; that is the main question. As to whether Russia will come, or Persia will come, or whether Affghans will come, that is a question that I do not pretend to enter into, and I hope it is one that within our generation we shall not need to discuss.

The CHAIRMAN: Probably, before Mr. Campbell replies to any of the observations that have been made, it may be convenient that I should briefly state my own views upon the subject. In making that proposition, however, I would beg it to be understood that I do not speak in any official capacity whatever; I speak simply as an observer like any other gentleman who may be present at this meeting, and I think there are certain grounds which really entitle me to give an opinion, for it so happens that it is now thirty-five years since I first went into the public service in Persia, and that from that time to the present I have been continuously engaged in studying, and occasionally in directing, our relations with the nations of Central Asia, so that, as far as experience goes, I may be permitted to speak with some authority, at the same time, of course, I may be liable to error like any other gentleman. Now, with these few words of preface, I would just ask the meeting to consider what the real question before it is; I mean the political question, for that is the most interesting point for the public, not that I at all undervalue the geographical and ethnographical portions of Mr. Campbell's paper, they are all of first rate importance. But the particular question which, undoubtedly, at the present time most engages public attention is, how far there is any real danger to India from the position and movements of Russia in the east, and if there is any such danger, how it may best be met. On this point, then, I say frankly that I do not believe there is any *real* danger at all. When I say *real* danger, I mean danger of actual invasion. If the public understood what the present position of Russia in Turkistan was, or what it may be in the future, I think that very much of the present feeling of apprehension would be dissipated. But, unfortunately, great ignorance prevails upon these subjects. The general notion is that Russia has overran all Turkistan, and annexed it, has, in fact, conquered the whole country, and has thus become almost a neighbour to us in India. But such is not by any means the case, all that Russia has really done up to the present time is to conquer and annex the country as far as the Jaxartes. That projecting line which you see marked on the map by a thread, stretching from the Jaxartes beyond Samarcand, is not a conquest, it is a mere cordon of military posts. Russia has not, in fact, annexed any portion of the country on this side of the Jaxartes. Although she occupies Ura-tepeh, Jezzak, Samarcand, and Katta-Kurgan, it is merely as a military cordon, established for a specific purpose. This advanced movement, indeed, was suggested by one of her Generals, for the purpose of what we call, in nautical phrase, "breaking the line." The object, as Romanoski distinctly says, of pushing on to Samarcand, was to divide the territories of Kokand from those of Bokhara, and to press equally upon both. Although, indeed, she has thus run a line of military posts as far as Katta-Kurgan, she has not annexed any part of the country south of the Jaxartes, that is, she does not collect the revenues, nor does she exercise jurisdiction. There are, in fact, no Russian courts, or any of the machinery of government such as is in full work on the northern side of the Jaxartes. Let us consider, too, what she proposes to do in the future, what is the political position at which she aims? She intends avowedly, sooner or later, to bring the Khanates as much under her control as possible. But she never meditates conquest or occupation in the wholesale way in which we have conquered and occupied India. She is perfectly aware that such an entire supercession of native power is beyond her means. To occupy and annex the three Khanates, to incorporate them in her dominions, to collect the revenues, to bring the Russian laws into play throughout the country, would require probably an Army of 100,000 men, and for such a gigantic task she is not prepared. All that she proposes, then, to do, is to exert a strong influence over the country, to maintain a military occupation at certain points, but to keep the native governors generally in power, and through them to exercise

a full political control over the inhabitants. Now that is precisely the position in which we were placed during our occupation of Affghanistan in 1839–42. It is a false position for any European nation to occupy in Asia, and it would be for Russia in Turkistan a still more precarious position than it was for us in Affghanistan, inasmuch as she would be much further from her supports, and would be without any party in the country to befriend her, such as we had in Affghanistan. Therefore, if she realizes what her own Officers say she aims at, she will be in a position in which we shall have much more power to injure her than she will have to injure us. That is the great truth which I am anxious to point out. Instead, then, of our having to apply to her for forbearance, the more natural course would be for her to apply to us for forbearance. So long as affairs remain in the position I have indicated, it is quite absurd to talk of danger to India from an invasion by Russia. All that she could ever possibly do would be to intrigue with the Affghans, and through them to create disorder on our frontiers. But if she attempts anything of that kind we have the means of retaliating. I am, of course, putting an extreme case. At present we know that Russia has no intention of the sort, and it is very unlikely that she will ever have any such intention. It is true that in the semi-official Russian papers allusion is made to the possibility at some future time of a Russian demonstration against India. It is argued, indeed, by Russian politicians as one of the most valuable results of their present movements in Central Asia, that in the event of any complications in Europe, Russia will be in a far stronger position as regards England than she was at the time of the Crimean war, and who will gainsay this argument? It is a self-evident truth, and if Russia did not avow the feeling we should all equally know that it existed. But it is equally possible that she may exaggerate the value of her present improved position. I do not myself think that that position, regarded as a better means of injuring us, is really of any great importance. At any rate, if we keep up friendly relations both with Persia and Cabul, it seems to me that Russia is nearly powerless to harm us. I lay great stress at the same time upon those two points, and it is in that view that I think we have acted most judiciously, I will not say in subsidizing, because we have not subsidized, but in establishing friendly relations by means of a liberal pecuniary assistance with the Ameer of Cabul, and I further think we should equally be acting judiciously in exerting ourselves, as was suggested the other day by Sir Vincent Eyre, in the lecture he delivered in this room, to strengthen our interests in Persia, and to cultivate intimate relations with that power. So long, indeed, as we are really on sincere and cordial terms with our neighbours in Persia and Affghanistan, not only can no invasion or demonstration against India be attempted, but no possible intrigues, if they were attempted, could succeed in raising trouble on the frontiers. There are two further points referring to our relations with Russia which I am desirous of briefly noticing. Firstly, it has been suggested by some of the leading organs of the English press, as well as by others in India, that there should be some specific agreement or convention with Russia for the neutralisation of Affghanistan, and this suggestion seems to have been very favourably received by the public of both countries. The second point refers to the announcement which was made the other day in this room by Sir Roderick Murchison, that the Emperor of Russia had officially declared that Affghanistan was beyond his sphere of action, that under no circumstances would he interfere in any way, politically or otherwise, with the Affghans. Now I must say that if such a communication has been really made, it must be received as a very gratifying mark of the good feeling of a friendly power, but I do not think it can have any practical bearing upon the future treatment of the Central Asian question. I should at any rate feel exactly as comfortable, and probably more independent, if no such assurance had been given. I think we are strong enough in India to look after our own interests. I cannot conceive any necessity for our going to Russia to propose a convention for a delimitation of frontier. I think it would be better that matters should be left to run their course. As I said before, Russia has as much need of forbearance from us as we have from her. At the same time I do ask, what is the use of all these jealousies and recriminations? Surely Asia is quite large enough for both of us. I should say let Russia run her own course in Central Asia without any interference on our part; let her settle and

colonize the Khanates. It will take her a long time, it will take her at least a generation before she brings them into any real subjection to her authority. Let her occupy herself with that task, and if she succeeds it will be a great gain in the way of civilization. As philanthropists we must needs wish for her success, and politically I really do not think it matters much one way or the other. In the meantime I think we ought principally to attend to our own duties in Hindostan; and, secondarily, to cultivate friendly relations with our neighbours. Let us conciliate the Affghans by liberal presents of arms and money, for that is the only way effectually to touch them, and having once secured them in our interest, let us maintain them as a sort of "buffer," to prevent a contact with powers beyond them, which might, under certain circumstances, be dangerous. There is one other point which has not been alluded to, but which is nevertheless of some importance at the present crisis, I mean, commercial rivalry. Putting aside all political questions, I still think there will be, as a necessary consequence of the recent movements, considerable commercial rivalry between Russia and England in Central Asia. Russia is exceedingly anxious to bring her own produce and manufactures into that country, and she will thus be naturally disposed to shut out our commerce as much as possible. I need hardly remind the meeting that the doctrine of free trade has not penetrated into Russia. In St. Petersburgh they are still protectionists, and maintain a prohibitive tariff upon our cotton goods up to the present day, and this system will assuredly be extended to all the Russian conquests in Central Asia; but this after all is an evil that will correct itself, because if the Indian trade is found to be lucrative, there will arise an extensive system of smuggling on the Turkistan frontier, which will be most injurious to the exchequer and most damaging to public morality (as has been the case on the Western frontier of Russia). Before concluding, I cannot help saying that I think it is a great pity a discussion of this important subject has not been entered upon in a more public and general way. I regret exceedingly that on two occasions such discussions should have been stopped in Parliament. I still hope, however, the day will come for a full discussion. It seems to me that the more this question is ventilated, and the more the *pros* and *cons* of it are publicly discussed, the more tranquillizing will be the effect both in India and England. In India the public will learn that Russia is not advancing with mighty strides, as we sometimes hear, to swallow us up bodily. They will learn that she is really stationary; that she has no desire to injure us; and that if she had any such desire she has not the power. While we, in England, shall also derive considerable benefit from the discussion. One result will be that we shall see it is not wise to irritate a friendly power by querulous and premature complaints; that it is not wise either to try and bind a giant in the silken cords of diplomacy. What we should do is to pursue our career of good government and improvement in India; to avoid all causes of offence and misunderstanding with our neighbours, while, at the same time, we take all legitimate precautions with the view to strengthen our own position, and are prepared if the occasion should arise to adopt any further measures that may be necessary for the protection of our interests or the vindication of our honour.

Mr. CAMPBELL: Gentlemen, I deem it a very great happiness that my feeble efforts to inform you, have been the occasion of bringing out so much more ripe and authoritative an exposition of this subject, from our gallant and learned Chairman, who has just addressed you. I feel that what he has said almost relieves me of the necessity of adding much more upon the subject by way of reply. I am afraid I have detained you a long time. I have beat a long way about the bush, but Sir Henry Rawlinson, as far as the political question is concerned, has stated the very kernel of the matter. He has explained clearly and authoritatively that Russia has not conquered Turkistan, but has only established a chain of military posts in a certain portion of that country. I am proud to have a confirmation of the suggestion that I ventured to throw out, that if Russia should determine to conquer that country it will take her a long generation to do so; also that it will not be profitable to Russia to attempt the conquest of that country; and that the probability is that she will not attempt it. That has been put before you so clearly by Sir Henry Rawlinson, that I think the political part of the argument has been clinched, and made

evident to almost every one in this room. I do not think there are many more points on which I need say much. I would rather avoid expressing an opinion with respect to the negotiations with the Ameer Shere Ali. I have no information upon that subject: and I should be sorry, as a servant of the Indian Government, to attempt to express an opinion at present. Therefore, I will only say generally, that I most thoroughly and heartily concur in all that has been said by Sir Henry Rawlinson and other speakers, with regard to the expediency of cultivating friendship with the Ameer of Cabul. I believe it is desirable in every way, whether for Indian interests, or for Affghan interests, or for our policy and commerce in Central Asia, to cultivate friendly relations with the ruler of Cabul. To give him assistance is a different matter. And how far we should assist him or pledge ourselves in any degree as to assistance in any shape in the future is a matter upon which I would rather not express an opinion, because I have not the means of forming an opinion. I should like to say one word, as respects the declaration of intentions and policy of the Emperor of Russia to which allusion has been made, and which Sir Roderick Murchison announced in this room the other day. I think Sir Henry Rawlinson's remarks have so far differed from me on that point, as to lead you to believe that I was wrong in expressing pleasure at that announcement. With every deference, I will say this, that while I thoroughly concur that it would be altogether inexpedient for us to go to the Emperor of Russia and say, "We are excited and annoyed by these rumours of your proceedings, we hope you will tell us that you are not going to injure us," I think, on the other hand, the Emperor of Russia, being a friendly power and having himself an interest in Central Asia, being at least as vulnerable in that quarter as we are, if the Emperor of Russia, as a friendly power in Europe, thinks proper of his own accord to come forward and tell us that we need not disturb ourselves, since he pledges himself not to interfere in Affghan politics, we may very well accept that assurance with the same frankness that he has made it. It is an indication of good will on the part of Russia, which we ought to accept, as tending to a good understanding advantageous both to ourselves and to Russia. As I ventured to say before, if we throw dirt enough, some of it is sure to stick, so if we propound ever so false and ever so unreasonable ideas upon the subject of Russia through the press, it permeates the public mind; and it is, no doubt, the fact that the public mind in this country has been a good deal drawn to this subject. Then, there is another view to be taken. It is said that the native mind in India is disturbed by these reports. I will say at once that if, in any degree, the native mind in India is disturbed on this subject, we owe it entirely to ourselves. I believe nothing has happened in Central Asia, and nothing has come from Affghan sources sufficient seriously to disturb the natives. The natives of India know the Affghans as well as we do, and scarcely believe, and, at all events, do not act upon their stories. I think there is not much importance to be attributed to these stories among the natives, except so far as they are derived from our newspapers. Is it not the fact that our newspapers teem with alarming rumours with respect to Russia? We are told that Russia is here, that Russia is there, that Russia has crossed the Oxus, and so on, as if they were at our doors. These paragraphs appear in our English newspapers. You do not suppose that those paragraphs are not copied into the native newspapers? Of course they are. We do all we can to excite the native mind, and make them believe that we are really apprehensive of the Russians. Therefore, I think if the Emperor of Russia does come forward and say he does not intend to push towards our frontier or to interfere with Affghanistan, if we have the pledge of the Emperor of Russia, who is the responsible head of a great European State, that he will not interfere with Affghanistan, I say it will relieve us of a good deal of trouble, and especially of some of those reports which may affect the native mind. I do not allude to the Persian route, because I feel that that is a subject that has been fully discussed for the last thirty or forty years. The Russians are no nearer to us in that direction than they were; and in the presence of Sir Henry Rawlinson I would not attempt to give an opinion upon that subject.

The CHAIRMAN: Before the meeting breaks up, permit me to express your unanimous thanks to Mr. Campbell for his paper.

Evening Meeting.

Monday, April 19th, 1869.

MAJOR-GENERAL F. W. HAMILTON, C.B., Vice-President in the Chair.

NAMES of MEMBERS who joined the Institution between the 14th and 19th April, 1869.

ANNUAL.

Bacon, Francis, Lieut. Roy. Mar. Art. 1*l.*
Rowley, Henry F., Lieut. 78th Highlanders. 1*l.*
Campbell and Stratheden, Right Hon. W. F. Bacon, Major 46th Middlesex Rifle Vols. 1*l.*

A PROPOSITION FOR ONE GENERAL MILITARY SCHOOL FOR THE ARMY.

A paper by Colonel T. BERNARD COLLINSON, R.E.,

and read by the SECRETARY.

THE CHAIRMAN: The Secretary will now read a paper by Colonel Bernard Collinson, of the Royal Engineers, who is at present at Malta. I regret that in consequence of that circumstance he will be unable to read the paper himself. After it has been read I shall invite discussion on it, and I have no doubt that some gentlemen present will offer some observations and open the way for the discussion of a subject so interesting to the future of the Army.

The SECRETARY: The appointment of a Commission to inquire into the system of Education of Candidates for Commissions in the Army offers a legitimate opening for the discussion of the subject in general, and one which the Royal United Service Institution can fill with great propriety, and no doubt with benefit to the labours of the Commissioners.

The following propositions on the subject will serve at least as a basis for the discussion; they are the results of personal experience in the education of young Officers. In taking up such a subject, it seemed to me desirable to begin from the foundation of the qualities required in an Officer; but it is done in a rude, imperfect manner, for it properly involves questions too intricate and extensive for me to deal with, or for such a paper as this. In attempting it, I have endeavoured

to classify the branches of the Army without any predisposition to overrate the importance of any one part of a service, the efficiency of which, though depending in a great measure on the mutual co-operation of all branches, is really based on qualities beyond the reach of any scheme of public education.

1. The qualities one would desire to see in young men seeking to be Officers in the Army may be classified in three great divisions; 1st, *Physical Strength;* 2nd, *Imagination;* 3rd, *Reasoning Power.* These three great branches of human faculty may, in their various ramifications be considered to comprise every quality, and practically to embrace every branch of knowledge that an Officer in the Army should possess: it is the comparative extent of each only that requires to be varied for the different branches of the Army. But if we assume that the following qualities are comprehended under each head, then every Officer in every branch of the Army requires a certain amount of each.

1st. *Physical Strength.*—Under this head would be included skill and activity in all kinds of sports and exercises, as well as a certain amount of bodily health and strength; without this no body of Officers, however talented or able, or otherwise powerful, would be efficient for active campaigning. With it, and with habits of discipline, as long as there are some able men to guide the Army, talent and learning are not of so great importance to the body of the Officers.

2nd. *Imagination*, or the faculty of readily taking in ideas, and of perceiving and retaining, and to a certain extent arranging impressions of things; being quick-witted and ready of resource; the quality which makes a man quick to learn practical things, and to invent practical remedies in difficulties. It is not easy to test the qualification of any person in this faculty. Those who have it, are generally artists of some kind, or linguists, or experimental philosophers; and the presence of these gifts affords an index of the probable existence of the quality. It is one of great value in Officers, and has been a chief ingredient in the character of many great soldiers.

3rd. *Reasoning Power*; or the capability of induction; of comparing and deducing conclusions from facts and circumstances, and judging of the future results of them.

This is a faculty which, though not always nor fully appertaining to men of mathematical quality of mind, is generally more or less connected with that quality, so that its presence can be taken to a great extent, as an indication of reasoning power in general.

Though an essential quality in great leaders of armies, and in some branches of the Army, it is not so with Officers of an army generally, as compared with the two other qualities.

2. It is of course necessary that Officers in the Army should also possess some knowledge of certain branches of learning and arts; and the tests necessary for ascertaining the required qualifications in these subjects, will be also available for testing the presence of the required amount of each of these three faculties above-mentioned. For instance, it is advantageous that Officers generally should be acquainted with modern languages and history, and should also be able to draw correctly plans and views of countries: the tests for these subjects will

help to show the amount of imagination they possess. And the tests for ascertaining their mathematical and classical knowledge, of both of which Officers should possess some amount, will also test their reasoning capability.

3. The Officers in the different branches of the Army, that is to say Infantry, Cavalry, Artillery, Engineers, and Staff, will require to possess these qualities in different proportions.

For the Infantry Officer, physical power and readiness of resource, are of more importance than reasoning power. Cavalry Officers would require the same qualities in the same proportions, but in a higher degree: because they have the additional duty of the care of animals, and their work extends over a greater field, both in space and kind. Artillery Officers have not only the charge of animals and machines, but work extending over a greater field than Cavalry or Infantry, and which requires a greater knowledge of physical science. For them, therefore, reasoning power is of greater importance, and all the qualities are required in a higher degree. Engineer officers have comparatively small charge of men, animals, or machines; their work lies chiefly in dealing with everything relating to physical science, and to mechanical construction in an army, which necessitates greater reasoning power; at the same time from their being constantly required to exercise their knowledge under divergent difficulties, they also require a fair amount of the imaginative quality. The Officers of the General Staff of the Army require a large amount of physical strength from the constant demand on their activity; and a large amount of imaginative power, as their duty mainly consists in collecting and collating information for the Commanders; but as they are not required to form conclusions on the information, they do not require so great an amount of reasoning power.

4. The next question is, what is the best mode of obtaining these different classes of Officers for the Army; whether by single examination from the ordinary schools of the country direct, or by special education in a separate school?

As regards the Officers for the Infantry and Cavalry there is little difficulty. The education in the public schools of the country is amply sufficient to insure every qualification in the way of the knowledge they require, and affords the best means of testing the amount of the three above-mentioned faculties they possess. Such technical knowledge and training as they require can be given them in their regiments after joining, better than in any special school. Their qualifications can be perfectly well tested by a single examination when they come to the age for entering the Army, direct from the ordinary schools of the country. There are some great advantages in this system, which is that now in practice for obtaining the greatest part of the Officers of the Army. The young men are not removed from the ordinary course of the education of the country before the time for their trial; they remain to the last moment subject to the influence of the public schools, or such teaching as their own friends select, and if at a public school, there could hardly be desired a better training for the Army; it is much better than that of any possible special army school. Indeed

special schools are to be avoided as much as possible; they inevitably tend to hand down from generation to generation a narrow system and fixed ideas, in which all the Officers there educated grow up. If they are self-supporting, they will be too expensive for a large class of persons whose children are otherwise very suitable candidates for the Army; and if not self-supporting, they will entail a public expenditure extravagant for the object.

5. In some cases special schools are absolutely necessary, as we shall presently have to consider; and when they are necessary it seems equally so,—as we shall consider hereafter,—that the candidates should be taken at a much earlier age than that at which they would get their commissions under the direct system, so much sooner, therefore, from the ordinary schools of the country.

6. The mode in which the existing system of direct examinations is carried on, has considerable disadvantages, the chief of which is, that it encourages and almost necessitates some months' special training under those private tutors who have sprung into so flourishing an existence since competitive examinations began, and who feed the head at the expense of the body, spirit, and understanding. These disadvantages might be avoided, either by so arranging the test examination as to be more in accord with the ordinary education in the public schools, so that there would be scarcely any difference between them and the extrance examinations to other institutions; or, by placing a certain number of commissions at the disposal of certain schools under proper restrictions. This latter plan, which was once tried with success for Woolwich Academy, is now in disfavour, in consequence of the abolition of somewhat similar conditions existing between some public schools and colleges; those, however, whatever their merits or demerits, would be very different from such as would exist between public schools and the totally independent War Office.

7. But the Officers of artillery, engineers, and staff, require a greater amount of special training. Coming to the profession with higher qualifications in the imagination and reasoning faculties, they have to learn something of the theory and practice of their profession, which they cannot well do after joining for service. They have to learn gunnery, fortification, surveying, military history, and the application of mechanics to their special duties. A special school is necessary for these objects, just as special schools are necessary for teaching the theory of other professions.

8. The candidates for these three branches can be efficiently taught in the same school. The qualifications for entrance are of the same character, different only in degree, and the course of special education is nearly the same. There would be no greater difference between the candidates at entrance than now exists between the highest and lowest successful candidates for the artillery and engineer school at Woolwich; the highest unsuccessful candidates for which school frequently enter the Military College at Sandhurst, and there can be little doubt but that the highest successful candidates for Sandhurst could get into Woolwich. The course of education in the school would have to

be somewhat varied for the candidates for each of the three branches, as is done in many schools.

9. Assuming that it is practicable to combine them in one school, there are many advantages in having only one such institution for the Army. Up to a certain size (the maximum may probably be placed at 400 scholars) one school is more efficient, as well as more economical than the same number of scholars divided. The number itself is a means of training, a larger world of discipline. A higher class of masters can be employed, and being in greater number together, can assist each other more. The educational appliances can be on a better scale, and also the arrangements for board and lodging. The greater number of candidates affords a greater choice for all branches, and the greater number in the school gives each branch a greater choice. The greater the school the less tendency to narrow and fixed ideas, especially when several branches are combined.

10. The age at which scholars should be admitted to such a school is one of the most serious parts of the whole question. To take them a year sooner than necessary from the ordinary schools to begin a special limited course, would lose much of the good of those schools; but the course of subjects above enumerated as requisite for those three branches could not be satisfactorily taught under two years, and to keep young men at school beyond the ordinary age at which the majority of Officers get their commissions, would give the latter an unfair start in life, and make the school unpopular. But the most serious point is the discipline. The difficulties that have arisen at Woolwich and Sandhurst of late years in this matter have their origin, I believe, in the impossibility of forcing young Englishmen of the age at which they enter the universities, to begin to go through the discipline absolutely necessary for Officers in the Army. Those who get direct commissions are subjected to it by being mixed with a larger body of older Officers, who have the habits of discipline, and whose business it is to carry on duties necessitating strict obedience.

11. A body of young men living together at the age at which their fellows at the universities or in life are accustomed to have a certain liberty, will not submit to the precise regulations on all the minor affairs of life, the practice of which altogether makes up the habit of discipline. Discipline is a habit much more than a reasonable conclusion, and like all other habits it cannot be commenced too early; but it is absolutely necessary to begin before a young man commences to form his own judgment, not because his judgment would necessarily go against the discipline, but because from the nature of it he demands greater freedom.

12. There is a certain discipline at the universities, but it is very different from the precise regulations for time, place, and circumstances in military life; a young man goes to the university to learn to think, but he goes to a military school very much to learn to obey without thinking; and it is unnecessary in universities open to all professions and to all the world, to practise such strict discipline of body, because the very fact of the young man's prospects in life depending on the use he makes of the university, should induce sufficient discipline. But

in educating for a profession of which discipline of body forms an essential part, it would be unjust to the country not to enforce its practice specially. The above consideration would, I think, necessitate that the age for admission to such a school should be at least two years before that at which direct commissions are given.

13. Assuming the age for entrance to the military school to be about 15, the next question concerns the tests for entrance, and the course of study in the school.

It is, I think, a very important point that the subjects for the entrance examination should be few. The Reports of the Public Schools Commission, and the results of the examinations at Woolwich and Sandhurst, all seem to me to prove that it is impossible to educate a boy properly in more than two or three subjects. When it is attempted to teach a boy more than that number, it is not education but mere superficial book knowledge, which fills his head to repletion, and strains his intellect beyond its natural powers in the attempt to take it all in. The consequence is, that when he gets his commission, at the age at which he ought to begin to educate himself, his educational forces are worn out, and a reaction against all kinds of study takes place.

14. Now, it is very necessary that every candidate for the military service should, at fifteen years old, possess a good knowledge of simple *Mathematics*, of *Geography*, and of the elements of *Natural Philosophy;* a certain portion of these should, therefore, be compulsory in the entrance examination. The mathematics, which should include the elements of algebra and geometry, is the only one of the three which would require a real education; the other two would be merely the grammars of subjects to be subsequently studied, and would be learnt almost by rote. In addition to these three compulsory subjects, one, and one only, of either of the following subjects might be taken up, according to the education and faculties of the candidate:—

Classics; because it appears probable that they will continue to form the chief subject of the education of young men in England, and because they are good for indicating the presence of both the imagination and the reasoning faculties.

Mathematics, including algebra and geometry; because it is a subject indispensable to two of the branches of the school, and indicates the reasoning power.

Modern Languages; because they are valuable to all branches, and indicate the imaginative qualities. But only one language should be taken up, and that should be studied like the classics, thoroughly, and in connection with history.

The entrance examination, though confined to a small range, should be searching; its object being not to ensure extent of knowledge, but to ascertain that the candidate has been well grounded in the elements of education, and that he has the qualities which will enable him to learn the subjects requisite for his military education.

15. It does not seem to me to be necessary to include any branch of drawing in the entrance examination, although it is an indispensable acquirement for a large portion of the scholars. The fact of its forming a considerable part of the course of the school will be sufficient to

induce those who have the gift, to cultivate it, and any further encouragement would make them neglect some more important study to obtain a little extra skill in this.

16. Before any candidate is examined in his mental qualifications he should be examined in his physical powers. For this object certain physiological standards would have to be very carefully determined, and every candidate should be required, by means of some practical experiments, to prove his qualifications in these standards. Up to a certain point these should be compulsory on all candidates; but it would be desirable to encourage simple gymnastic exercises beyond the average standards, in order to induce public and private schools to practise a systematic course of them. But not much beyond the average, otherwise there would be danger that the natural tendency of English boys towards these exercises would be encouraged to strain their powers too much at so early an age.

17. Similar physical tests should form part of the examination of all candidates for direct commissions in the Army. But the ages of the candidates being greater, the compulsory tests may be higher, and greater encouragement should be given to extra exercises, by giving higher values to the credits for them, which credits should be allowed to count towards determining their places in the examination list.

18. The course of education in the school should include the following subjects:—

1. *Mathematics.*—This should form the leading branch of the education, because it is the one that brings out the exercise of the highest faculties, and is an essential foundation for the study of nearly all the other subjects in all three departments of the school. The complete course of mathematics should include mechanics and all branches of natural philosophy.
2. *Surveying.*—This is the subject of next importance after mathematics in the military school, because it is a most desirable, if not necessary acquirement for Officers of all three branches; and some knowledge of it is indispensable to the study of some of the other subjects. The full course should include drawing, both artistic and geometrical, the representation of ground in plans, the use of surveying instruments, and the theory of astronomy and geodesy; but very little practical surveying should be practised in this school.
3. *Modern Languages.*—I place this subject next in importance, because it requires more study than the subsequent subjects, and is one that can be more efficiently studied at this age. One language only should be taken up at once, and that should be fully studied in connection with the history of the country. Professors of modern languages should not be mere teachers of colloquial phrases, but of the science of the language and of the history of its country.
4. *Fortification.*—This should, of course, form a special subject of study to those who wish to go into the engineer branch; but some knowledge of it is necessary to all three branches. It should include the theory of the construction, and attack, and

defence of fortresses. A little practical acquaintance with field fortification is necessary, but only just sufficient to enable the pupils to understand the details of the attack.

5. *Gunnery.*—This subject would be specially studied by those intended for the Artillery branch; but all three should have some acquaintance with it. It should include, mechanics applied to the construction and use of fire-arms of all kinds, and of the machines connected with them; the chemistry of all kinds of explosive compositions. The practical exercise of guns and machines would be more properly included under the head of drill.

6. *Military History.*—This subject would be important chiefly to those intended for the staff, but is, of course, a very desirable one for all branches. The course should include the general military history of all countries, and the theory of tactics, and of the constitution of armies, but not the strategy of campaigns and battles in detail. A boy of sixteen can learn something about the movement of troops, but it would be waste of time for him to attempt to study strategy.

19. In each of these six subjects there should be a maximum and a minimum course; and at the commencement of each term, each scholar should be obliged to select the subjects and courses he wishes to take up during that term, so as to enable those, who wish to prepare themselves specially for either of the three branches, to study the subjects desirable for those branches. The absolute selection, however, of the scholars for each of the branches need not be made until the final examination. From the results of that examination, the best scholars in mathematics should be appointed to the engineers, the best scholars in gunnery to the artillery, and the best in the three subjects together of military history, surveying, and languages, should receive commissions in the line, and be recorded as qualified to enter the Staff College. There should be, of course, a minimum qualification in each subject, and those who failed to reach that minimum, or who, for any other reasons, could not be provided for in any of the above three ways, should receive also free commissions in the line, but without being considered qualified for the Staff College.

20. The physical education of the scholars should be very carefully attended to during their stay at the school; and its chief aim should be, not to make them skilful in military exercises, but to develop to the utmost their natural strength and health. Keeping this result in view, they should be practised in the use of military weapons of all kinds, and in the drill of all branches of the Army, but not in more drill than is necessary for discipline and health. A certain amount of gun drill and artillery exercises should be practised, and riding and cavalry exercises, and they should be instructed in the management of horses. Simple gymnastics of all kinds should be regularly practised. In order to encourage and methodize such exercises, it should be treated as one of the regular branches of education; there should be an examination in it, and the credits so obtained should count towards determining places for the Artillery and Staff.

21. The administration of such a school is a subject in which I think

an alteration is desirable from the present system in both our military schools. In both, the Officers who have charge of the discipline, are a separate body from the professors and masters. The latter have very little to do with the discipline of the scholars, even when in study, and nothing at all when out of study. The former are only concerned with their outward behaviour as young soldiers, and not with their mental or moral discipline. It is this division of responsibilities which constitutes the difference in this respect between a public school and a military school. I do not think it is indispensable in the latter: the majority of the subjects of education are such as Officers in the Army can make themselves efficient masters in, and I would make the military masters also the Officers of discipline. I would select one of them and make him, with a suitable Army rank, the Commandant of the school, with powers and duties similar to those of the head master of a public school. He would generally, but not necessarily, be selected from the masters in mathematics, surveying, or military history, probably from the two latter, as the head master in mathematics would generally be a civilian. A certain number of the next senior military masters should be appointed the Captains of the Companies of Cadets, and each should exercise a general supervision over the education and conduct of all the cadets in his company. And I see no reason why a similar practice to that which prevails in our public schools, and which is so conducive to the influence of masters over boys, should not be adopted in our military schools, namely, that the cadets of one company should take breakfast and supper together in company with their captain, and that the whole of the military masters and the whole of the cadets should dine together in one room every day.

22. It is hardly within the province of such a paper as this to discuss with whom the general control and government of the military schools should rest. The only point about it which I consider very important as connected with the detail of the working of the school is, that the Commandant, such as I have above described, to whomsoever he may be responsible, should be solely and wholly responsible for the efficient working of all branches of the discipline, education, and recreation of the school.

23. The education of the Officers of the three branches of the Army above mentioned cannot, however, be considered as concluded on their passing satisfactorily through such a school. They have each a good deal still to learn of the technical parts of their respective branches, and which in their particular cases cannot be satisfactorily taught, except at some central establishments. The Staff Officer has to practise surveying, perfect himself in the drill of the various branches, and study the details connected with the art of war. The Artillery Officer has to practise gunnery, and the manufacture of explosive compounds, and artillery exercises. The Engineer has to practice surveying, construction, field operations, bridge-making, and the various semi-scientific duties that fall to his lot. It is hardly necessary to go into any detail on the subject of this subsequent practical education, because establishments already exist for all three branches for this

purpose, and all in very efficient condition, and quite available for the altered system of primary education I have recommended. After being appointed to their respective corps, the Engineer Officers would go to the Engineer School at Chatham, the Artillery Officers to the Artillery School at Woolwich, and those qualified for the Staff College, after serving some time in their regiments, should be sent to the Staff College at Sandhurst without further examination.

24. I will conclude with a word about the site desirable for such a military school as I have been describing. I think it very important that it should be at a good distance from any large town, and in a healthy district, with a good extent of open country about it, and yet, if possible, sufficiently near some large military station to allow the cadets to witness military operations without mixing habitually with the garrison. These considerations would point out Sandhurst to be infinitely preferable to Woolwich for the site of such a school.

The CHAIRMAN: If any gentleman will favour the meeting with any remarks upon the paper, I am sure they will be received with great pleasure. With regard to military history, that is one of the subjects which ought to be carefully studied in all military schools. We have gentlemen present who are quite capable of speaking upon that part of the question. Perhaps Sir Edward Cust will favour the meeting with his views upon the subject.

General The Hon. Sir EDWARD CUST, G.C.L.: I understand that many Officers have not attended here to-day because they do not agree with the sentiments expressed in the paper. I am one of those who do not exactly agree with the whole of the paper; nor do I believe that anybody would agree with all that they hear in this theatre. Yet Officers should come here to listen, to be informed, and to discuss. It is rather unfortunate that any kind of unfavourable impression should be previously taken of a paper that is about to be read here, and I trust that I have been misinformed in the matter. For myself, I desire to call attention to the first paragraph of the paper: — "The appointment of a Commission to inquire into the system of education of candidates for commissions into the Army offers a legitimate opening for the discussion of the subject in general, and one which the Royal United Service Institution can fill with great propriety, and no doubt with benefit to the labours of the Commissioners." Now, that is the point which has induced me to come here; but so far am I from agreeing with the proof of the intended paper that has been circulated, that I disagree from first to last with the proposal for "One general military school for the Army" to an extent, indeed, that some gentlemen may not be disposed to go along with me, but which I am anxious, if I possibly can, to get fairly considered by the profession. I start with this objection, that a special Government school of any sort or kind for so-called "cadets," prior to entrance into the Army, is a mistake. We do not find in any other profession—the church, the law, or medicine, or any other civil calling—that it is considered necessary there should be special instruction before-hand given to aspirants before they have been inducted into it. A general course of instruction is of course open to everybody, and students can select those studies which suit their disposition or their inclination, or the examinations through which they will have to pass; therefore I do not see why there should be any difference in this respect with regard to admission into the Army. No doubt there is a portion of the Army which is highly scientific, and it may be a reasonable question whether the class of Officers that enters it may not require some particular course of previous instruction; but even as a preparation for Engineers or Artillery, it is scarcely more than mechanics and chemistry, that is in excess of education for the Line. The only class that seems to me to require a particular course of instruction before admission into the service of the country is

that of the Officers of the Navy. There are such intricate and elaborate matters connected with the Navy, such as ship-building, ship-navigating, and ship-fighting, that it is hardly possible to suppose there can exist any class of men in the community who would be capable of at once entering into the Queen's service in the Navy without a course of education peculiarly adapted to that profession. But what strikes me as extraordinary with regard to the stipulated education of the Army is this, that whilst the most arduous, the most elaborate, and the most trying examination is required for cadets about to enter the Service; yet as soon as they have passed this ordeal, and do enter the service, the State seems to wash its hands of them altogether, and never to care one jot whether they retain what they have learned, or whether what they have learned evinces itself in useful results, or can in any way whatever be turned to good account, either for the public benefit or that of themselves. There seems to be an earnest and eager rush to get into the Service, but that position having been once attained with great difficulty, from that moment the whole thing is left to take its chance, and no inquiry whatever is made as to the results. The great mistake, I think, consists in this, that we throw all our attention upon the boy, and none upon the Officer. For my part, I think, instead of being so anxious about the education of the boy, we ought rather to inquire whether any practical good is derived to himself from this exceptional education. From what I have heard, from inquiries amongst Commanding Officers, I do not understand that those boys who come into the Army after undergoing these arduous examinations make, upon the whole, particularly good Officers, or that they are particularly well furnished with the information which good Officers ought to possess. But what I think is the great grievance, and what I am anxious to put prominently forward as the great evil of the present system is this, that from the moment a young man becomes an Officer at a time of life between twenty and thirty years of age, which, as every man knows from experience, is the time when he can acquire most information, from that very moment it is patent to every one that not one single attempt is made to give him professional knowledge beyond drill and the habitual fulfilment of regimental duties in the barrack-yard. I think this is to miss a very great advantage. I do not at all wish to propound any particular system of education, neither do I think that what Colonel Collinson has suggested here would carry out my object. I wish to see every young Officer, before he attains the rank of Captain, tested as to of what his knowledge of his profession consists. I do not know whether any gentleman present may remember the circumstance, but many years ago a Captain Peters established a new system of equitation for the British Cavalry. The riding-house at the Regent's Park barracks was appropriated to the task, and all the Cavalry Officers of the Army were required to go in squads from time to time, according to a roster that was established, in order that every Officer should be instructed in equitation under Captain Peters. I should wish to see a similar principle adopted with reference to that I have above suggested for the education of the subalterns in the Army. I should wish that those subalterns in the Army, who, in their turn of duty with their regiments find themselves in England, should be required, a certain number at a time, to go up for a few months for the purposes of instruction to the Royal Military College at Sandhurst. I do not know precisely the expense of the present maintenance of the Royal Military College; but there are no less than fifteen commissioned Officers and thirty masters and teachers, who constitute its educational staff. Now, I should like to see the junior department put down altogether, as the special school for gentlemen cadets. You see, there would be ample means, as far as the cost is concerned, of carrying out the plan which I am anxious to see adopted, namely, that the building now used for the boys, with a certain number of superior Officers to maintain discipline, and a certain number of professors and teachers, should be set apart for young Officers, who, in whatever numbers at a time might be thought desirable, should go up and take a turn of education during the period that they are subalterns at home. I am aware that a proposition of this kind has more sides than one; for example, that it might not advance materially the education of Officers. I am very well aware that it would not be easy to get young men between the ages of twenty and thirty to pass their time in study at Sandhurst, unless there were some absolute

advantages to be obtained by so doing; but I desire it to be made an absolute obligation on the part of the Government that they should do so, with the view of rendering the entire class of Officers more fit for service, and that they might be more fit for other duties of life after they quit the service; to which matter I will return presently. The only course that could be pursued for Officers of this class would be to give them oral instruction. It would be perhaps, impossible to get them to sit down to pen and paper and study mathematics, or subjects of that nature. My idea is that their instruction should be limited to very few subjects, such as military history, military drawing, military geography, and the principles of attack and defence. Military history is a subject to which I have devoted much of my attention, and I feel that it is the subject of all others that contains the best instruction for an Officer desirous of being initiated in the art and science of war. I do not know any scheme of instruction that could be desired which would give to an Officer so much valuable information as from the examples to be obtained from the reading of military history. One would like to see old Officers who have returned home from India, and from various other parts of the world, in which they have seen the practice of war, one would like to see such men rendered useful by inculcating some of their acquired knowledge of war on these listeners at the Royal Military College, giving to the rising generation of their brother Officers the benefits of their experience, pointing out to them what peculiarities and circumstances there are in the actual practice of war, as derived from their own experience and the history of the past. Young Officers can see no service at the present time, and it is not much to be expected that there should be any chance at present of seeing service in the field. How, then, can they possibly obtain any knowledge of what actual service is, unless you can convey it by instruction, drawn from personal experience, and the examples of history? I dare say, after all that can be said or done, many of the Officers would go away not much the better for anything that can be said or taught, inasmuch as they might neither care to listen to what they hear, nor to retain their knowledge. But what I feel is this, that there are a great many Officers of a totally different temperament; men who, in the experience of all of us, are not willingly left alone in country quarters, or barracks, to idle their time away, and lead a mere listless existence, if they could attain to any usefulness whatever; and this is by no means a small class: generally speaking the most valuable Officers are found in it, whose natural energies and ambition want to be gratified; and, I think, if these men once acquired a taste for learning and a little instruction, that they might be led on to drink deeper of "the hyperian spring." It is a good thing for a man to acquire a taste for study, but I believe they rarely acquire it from their competitive examinations, where all is mere "cramming," which fatigues and tires them to death. The instruction they would get from lectures upon actual service, given by Officers of experience, would call forth a very different taste for study, and lead them, in a great many cases, to read military history for themselves; if the inducement and leisure were afforded them. I think we have no right to conclude that young Officers would not give their attention to subjects of professional attainment, because, under the present system, they have never been led or induced to do so. I think if they were properly educated and informed upon a better system, they would rejoice in it, and their spirit would be roused to continue their studies in them on joining. I am aware that I am speaking to many military men who denounce all instruction on these subjects, who rejoice in the conclusion that as we have always been "victorious and glorious" wherever we have been, that, therefore, we can do very well without instruction, and that there is no necessity for it. I demur to that feeling altogether. First of all, I deny that the Army ought to claim any very great merit for what is rather the attribute of the nation that makes the Army; it is the spirit of the people, in their highest national characteristic, that makes the Army "victorious "and glorious." But however that may be, I do not see that that is any reason why the Officers of the Army should not instruct themselves, and improve their "victorious and glorious" position by reading. I am well aware that in a matter of this kind I am not likely to find that all who hear me will agree with me as to the employment of all the junior Officers of the Army in military instruction after they

join their regiments. But what I want to do is, to ventilate the subject. I am glad to find, from information I have received this very morning, that the Royal Commission on Military Education are about to take into consideration some scheme that will probably lead to this issue. I said a short time ago that it would be better for Officers to learn a little, and that a little mental culture would be advantageous to Officers, and would lead them to acquire more. But there is one other consequence that would, I think, flow from this. We all know how many Officers, in our experience, have retired from the Army after twelve or fifteen years' service, either to marry, or otherwise; these men go away, and they find the contrast of idleness to abstract service so great, that they would give their heads and ears to be employed anyhow. Well, the only pursuits they are fit for, as we know, are to become the governors of gaols, or to take charge of the police. Now, if they were better instructed while with their regiments, and had acquired a taste for instructing themselves, they would be fitted for many other duties, and I am perfectly certain they would obtain employment of a more suitable character. And, indeed, I think the time may come when Government may be pressed to employ these men in Government offices; but at present the Government is less likely to give employment, on account of their insufficiency of much useful knowledge. I will conclude by candidly expressing my individual opinion that the way in which Government manages the young Officers of the Army is, without exception, the most demoralizing and the most injurious to character that can be well conceived, and that it is very little creditable to the British.

Captain S. FARRELL, R.E., Professor Royal Military Staff College, Sandhurst: I think the chief proposition that Colonel Collinson has put forth is this, that "one general school" would suffice; and with that, he would lead us to accept the opinion, that this school should be for training the Artillery, Engineers, and Staff, while the great mass of the service, Infantry and Cavalry Officers would not require special training in a military school, but would be best drawn from the public schools of this country. That proposition must be very attentively considered, because I am sure that Colonel Collinson would be the last man to wish us to deny the truth of the old saying, "Knowledge is power." It appears to me from this paper, and from the remarks made by Sir Edward Cust, that between "twenty and thirty years of age" is considered the best part of a man's life for study. That quite upsets our old notions that the best time for education is while we are young, and that we should be taught when young. I think it most important that the foundation of education should be laid in our youth. We all know what the public schools are; and I do not think the great body of Englishmen will tell you that knowledge, *as knowledge*, is gained by a large mass of boys at public schools. But even if it were; *how* does Colonel Collinson propose to draw young officers from them? If young men are required to pass a test examination, is it not certain that public school boys would compete disadvantageously against those who have been privately taught? You will have no doubt on this point, if you examine carefully the records of Army examinations for many years past. Boys taught, three or four at a time, by an intelligent and earnest man, must have an immense advantage. That is the secret of success in getting into Woolwich; we were first thoroughly taught by a man, whose whole object in life it is to get boys well in, high on the list for Woolwich Academy. I am not now speaking from the point of view of a professor of either of the two junior schools. I have, perhaps, the advantage of knowing what men who have been through those schools are, when they come to the *Staff* College, and I am perfectly certain, that if you wish to have a man fitted to enter the Staff he must, as a boy, be taught the elements of many subjects. For instance, it is most grievous and vexatious to a man of twenty-five or thirty years of age to have to commence the rudiments of drawing and fortification; to be so stiff-fingered, that he cannot make an outline sketch of hills, and to be so tied down to the details of drawing "scales," and the simplest plans and sections in fortification plates, that he can make no progress in the theory or practice of the subject. It is most fatiguing to him. I am perfectly certain that the best education in these subjects must be begun in youth. It has been said to-night that we must speak openly here as brother Officers. Well, what

are our present schools? We have two schools, Woolwich and Sandhurst. Now, do people mean to say that those schools are failures? You may hear it said, that Sandhurst cadets coming into regiments are not very favourably looked upon, and objections are made to them. But will you deny that, at least Woolwich Academy has done good work? Sandhurst hitherto has never had a fair chance. I feel convinced that with the progress of events, that Institution can be so ordered as to produce much improved results. I should then vote for two schools in preference to one, because, if you have a monopoly of anything, it must be bad; and if you have the two schools well constructed, well organised, one will help the other. We should go from one school to the other school periodically, and see how each was going on, and take hints where we could improve either. I believe they would immensely, and I am certain that Sandhurst has improved very much of late years; and that it is now in a fair way of doing very well. But Colonel Collinson's proposal ought to be considered, perhaps, from another point of view. He says it is a bad thing to narrow your sphere of education. Is he not by his scheme narrowing the sphere of education for the Staff, which is the most important part of the Army? He says no man should get on the Staff unless, as a boy, he acquitted himself well. Why should you put a blot against a man's name, because as a lad he has not distinguished himself? It may be, and it is so, that some natures do not develop themselves in early life. A man may have been a little wild in his youth, but he might come to the front afterwards. It would be a very hard thing to adopt in our service the plan of only letting those men serve on the Staff who were formerly good boys. I think our present Staff system can scarcely be improved, as far as the Council of Military Education have laid it down. Of course there are many points of detail, which it is not for me to go into; but we have at present a wide field, with, at least, two *special* sources of supply, supplemented by five or six years' subsequent service as regimental Officers, with various other precautions taken as to the fitness of candidates for the Staff College, and to resign or abolish all this in favour of Colonel Collinson's plan would be, I submit, to the disadvantage of the future Staff of your Army. Now to go to another suggestion, how can you expect a young man when first commissioned to go to a regiment and learn as Colonel Collinson thinks he will learn? I maintain it would be doing him the greatest possible injustice. There are no inducements to study, you never could make it easy to study while with the regiment. He must come either alone to a regiment stationed apart, or he must come with half a dozen other youngsters to join at some large station. In large garrisons, or at depôt battalions, half a dozen young men enter the service at the same time. Can you picture to yourself the special inducements they find to study? It is a hard thing to study in a barrack room. It is a difficult thing *for any* man, even the most determined, to surmount the obstacles that beset him. His time is cut up, and frittered away by the details of regimental duties, daily parades, &c., &c., and is it likely that any, beyond a very small proportion, will be proof against these and many still stronger inducements to a life of greater ease, of one of pleasure rather than of work? He has work of a different nature to attend to, and his "head" work ought to have been previously advanced. You would do him far greater justice, and he would have learnt far more at a school, having had an extra stimulus by working with others. I do not know that I should here like to propose any particular system of study, because I have not been called upon to consider the subject very minutely. But I should rather object to taking Colonel Collinson's view of the course of *Entrance* examination, that is to say, putting mathematics first. I think that is against nature. I should put before a lad what nature makes it most easy for him to learn. We know that languages and the imitative arts are the most easy of acquirement for a boy up to sixteen. I should give him plenty of "Languages." Nature not only points out that these are what he can learn best, but they lay the foundation for a gentleman's education, give him a facility of expressing himself, and of mixing with the world. Mathematics, I would rather take afterwards. He should certainly be led to practise drawing, so as to get some freedom of hand, for many have at a later period of life found it difficult to acquire. Of the men who come to the Staff College, those who have been cadets have a great "pull;" they have an

immense advantage. That is plain matter of fact, recognized year after year by the members of every fresh batch. But in addition to drawing and fortification (concerning which there can be no question), why should you not teach young lads some science? Why should they not have an opportunity of attending lectures on Chemistry, and have the advantage of a laboratory, which they cannot have in a Regiment? Why should they not have their attention turned to Geology? As Sir Edward Cust says, it is a great advantage to a man in after years to have some subject of interest, and surely you must lay the rudiments of this knowledge with boys. There is one more thing, I should like to say, that is, if you work a boy hard from twelve to eighteen, you ought, I think to give him a holiday for a time—not an unlimited holiday. Nature will not continuously work! work! work! Give him six months or six years of work if you like, but then give him a little holiday. A young Officer, after working from twelve to eighteen, may go into a Regiment, and apply his mind to a new course; he may acquire much knowledge of the world, knowledge of foreign countries, &c., &c., all very essential to his future career; and after a time he will return to study with fresh zest, and will give the whole of his energy to further reading, provided a certain foundation has been laid before. I quite hope and believe that the present discussion by the Royal Commission will lead to a great improvement in our military schools. There is nothing to hinder their being made most valuable, with improved organization. But no Establishment in this country has ever come to the front, unless it was under the control of some guiding genius. It is so with any successful mercantile establishment (whatever it may be), there is the spirit of some able man who has guided it throughout, and formed its character. This is what we want in these Military Colleges. I do not say he should be a first-rate scholar, but a man who would command the confidence of the young, and be in all respects an able Chief.

Sir HARRY VERNEY, Bart., M.P.: I cannot agree with the sentiments of those Officers who seem to think that it is quite unnecessary for young Officers to be instructed before they enter the Army; because my idea is that an Officer, who has passed a course at Sandhurst, and has learned what he may learn at Sandhurst, is perfectly ready to take the field in active service, and to perform all the duties of an Officer in the course of two or three weeks. I should say it would take twice as many months to one who comes straight from a public school, and who has had no military education whatever. There is one special branch of military education which I think we hardly attend to enough, and which cannot very well be taught in a Regiment. I allude to the facility of rapidly and correctly surveying. I think there is nothing that an Officer ought to learn so much, and to have so much at his fingers' ends, as the power to ride over a country, and then when he gets back to his room or his tent to make a sketch of the country he has been riding over, showing with tolerable accuracy the features of the country, comparative heights and inclination of hills, &c.; that is a subject that ought to be taught. When I was at Sandhurst I was taught it to a certain extent. I believe that many who were cadets with me at Sandhurst were able to run over Bagshot Heath, come back to their rooms, and make some sketch of the country they had crossed. I think that is a branch of instruction which is peculiarly necessary for an Officer; it is not very easily learned in a Regiment, and it is much more easily learned when you are under 20 than when you are above 20. I think what Sir Edward Cust has said with regard to the attention paid to cadets, and the neglect of them when they become Officers, is a matter of the greatest possible importance. I daresay many Officers here have been present at reviews in foreign countries. I have been present on several occasions, and have been very much struck indeed, with the knowledge of practical warfare which is acquired by the Officers of the different *Corps d'armée* in Prussia, France, and Switzerland. In Prussia the different *Corps d'armée* manœuvre against each other. It is left to the ability and knowledge of the Officer commanding, and of the Officers of his staff, to manœuvre these bodies of troops against each other, as they would in actual warfare. We could perfectly well acquire that knowledge in our own country; I do not see why we should not. It would be extremely interesting to all military men, and I believe we should all learn a great deal by the practice, and that in exercises of this sort it would be found out which

Officers naturally possess that military ability. The sort of military ability to which I refer, is born with men. There are some people, possibly the ablest men in other knowledge and acquirements, who have no power of topography. I have been walking in the Mall in St. James' Park with Baron de Bunsen, the most learned man perhaps with whom I have ever been intimate, and he has said to me, "I do not know whether the Horse Guards or Buckingham Palace is in front of me, unless I see them." He had no knowledge of topography; another man has a map in his head, and an intuitive knowledge of locality; it was born with him. That is the very knowledge without which a man cannot be a great soldier. It is quite impossible that such a man can ever be a Quartermaster-General, or can command an army well. The great thing is to ascertain, what men possess that special talent by nature, and then to develop it to the highest degree. I believe it can be much more easily ascertained at a Military College than at a public school, or in a Regiment in our present regimental life. You find out at a Military School who has the talent. Sandhurst has been spoken of slightingly. Now, I think we learned a great deal at Sandhurst, and I have no doubt that we might have learned, but for our own fault, a great deal more. If any of us had gone out to the Peninsular war, I believe within a fortnight of our joining we should have been perfectly fit to be trusted to march a company across the country, if necessary, to throw up field fortifications for sudden defence, or attack those of the enemy, or to describe the country on paper. I think a man may learn all that at a Military School, which is of the most essential importance to him in service. It is all drill in time of peace, and you may have time to learn these things. But suppose we are engaged in war, a cadet sent from a Military School and getting his commission would be able to go at once to the scene of war, and to protect himself and his men; therefore, I am certainly of opinion that Military Schools ought not to be dispensed with, and I think with the Officer who spoke last, that they might be made very useful and very practical. I hope the Military Commission now sitting to consider the question of military education, will suggest something of the sort, with the view to improve the knowledge of Officers in the Army. It would also render the service more interesting and attractive, because I believe the more our Officers are educated, the more interesting they will find the service, and the more they will be attached to it.

Colonel C. ROBERTSON, Commanding 2nd Battalion 8th Regiment: I have but few observations to make. I shall endeavour not to go over any of the points which have been touched upon by Sir Edward Cust, or the gentlemen who have just spoken. I look upon the Army as a great training institution; in time of peace we all know that it is nothing more than a gigantic school. I think every Commanding Officer who appreciates properly his duties must feel that they are essentially those of a schoolmaster, and that his efficiency as such, mainly depends upon his success in training the Officers and men under his command to fulfil certain duties, and to perform certain exercises. He has no doubt other duties to perform, administrative duties, the duty of carrying out discipline and conducting courts martial. But I have always felt that my essential function was that of a schoolmaster. Consequently, I have taken a great interest in all questions of education; I have read everything that has come in my way both as regards the education of civilians and the education of the military. The conclusions I have come to I will endeavour to state in a few words. To make the subject clearer, I will separate the education of the military Officer into different parts—the preliminary education before he gets his commission, and then that which he receives after he joins his regiment. As to the preliminary part, all I should say is, that I entirely agree with Colonel Collinson, that special education is not required, —that it is positively hurtful. I think we cannot do better than take our Officers from the public schools. Experience proves that they make the best Officers; but besides appealing to experience, I think I could give reasons that appear to myself worthy of consideration. Why Sandhurst, where no doubt the course is excellent, where the professors are eminent men, and where there is great zeal shown in teaching, does not produce the effects that it might be expected to produce; the reason of this partial failure is the same that was given in the case of the public schools for the comparative failure of the immense expenditure of time and money to produce good

scholars. It was said that at Eton the boys were the sons of men of rank and fortune, and that they had consequently no inducements to learn, they were very idle, and many of them turned out to be indifferent classical scholars. Now, I think the same cause which renders the education of Eton boys a partial failure applies with great force to Sandhurst. I will not say that an Officer is always the dunce of the family, but the majority of young men that go to Sandhurst for commissions are not young men of studious dispositions. If they go into the Cavalry or Infantry, they know that their deficiencies, whatever they may be, will not prevent their getting commissions. Therefore, I say, the men that go to Sandhurst are not men that go there with the intention of studying hard. You collect together all the idle young men of the country, and then you expect good results. Certainly you ought not to expect them. Let the teaching be ten times better than it is, and you will still get bad results if you put all the idle together. This consideration accounts for what is certainly a fact, that the young men who come from Sandhurst are not, generally speaking, good scholars; the reason is they are not generally young men of studious dispositions, and that they are all collected at one place. I think if they were scattered at different schools, at Harrow, at Eton, at Rugby, you would have better results. I shall say very little more on the preliminary education of Officers, except this, that I wish it was extended a little more. I wish the ages at which Officers get commissions, instead of being from 18 to 20, were from 20 to 22, so that we might have young men from the Universities, of whom there are very few in the Cavalry and still fewer in the Infantry. I think it would be a great advantage to have more University men in the Army. Any young men joining the Army with a degree, I should put senior to every Ensign who did not possess some equivalent certificate. When he joined the regiment he should not be put at the bottom of the list of Ensigns, but he should be put above every Ensign who had not received a degree or other certificate requiring an equivalent amount of labour. Eighteen is the age young men leave the public schools and go to the Universities. At eighteen I should have an examination, similar to the Indian Civil Service examination, to select candidates for commissions without purchase.

In the Civil Service examinations no special subjects are prescribed, but the candidate is allowed to select any subject taught at the school in which he has been brought up. Candidates for commissions without purchase should, I think, be required to pass a preliminary competitive examination admitting of the same latitude in the choice of subjects. The successful competitors should receive conditional nominations to commissions, confirmation being dependent on the nominee within three or four years either obtaining an University degree, or else obtaining a certificate of having passed such an examination as evinced a competent knowledge of such subjects as might be prescribed for a special course of military studies extending over the same period of time as is required to obtain a degree.

I think such a system as this would produce better results than the present system of bestowing commissions without purchase exclusively on Sandhurst cadets.

The best men of a single school, and that an exceptionally idle school, could not possibly be so good as the best men of a set of competitors drawn from all the schools of the country both public and private.

I will go on to state what should be done with young men when they join their Regiments. There is nothing more difficult than to get young Officers of Cavalry or Infantry to do this kind of work; even to teach them their military duties is difficult. The system of regimental instruction is very monotonous and uninteresting, and there is no inducement held out for Officers to work voluntarily at extra studies. With the exception of a few men who go to the Staff College, the others have, generally speaking, no inclination to study. It is very difficult to devise any plan of instruction that will operate upon the whole mass of Officers. I myself should consider such an attempt as quite hopeless. In this respect I differ from Sir Edward Cust. I think such a plan as he indicated, would result in ingenious evasions and delusive shams. I feel sure that any attempt to make instruction systematic and study obligatory, would be intensely disliked, would be pertinaciously resisted, and would produce no good result. I do not therefore consider it advisable

or practicable to attempt to render the instruction of Officers systematic and compulsory in any other subjects than those which are essential for the due performance of the daily routine of regimental duties, and in which, by existing regulations, Officers are required to pass an examination in order to render themselves eligible for promotion. As regards other subjects, the only plan which seems to me the least likely to produce any good results is by suitable inducements to encourage Officers voluntarily to devote themselves to certain studies, and to acquire such kinds of knowledge and skill as it may be thought useful and desirable that a certain proportion of the Officers of every Regiment should possess.

The difficulty would be to devise some inducement which would prove an effective motive to study. I do not think the present system of selecting Officers for promotion good. The purchase system is, I think, a very bad one, but I doubt if it would be an improvement, to substitute for it a system of regulating promotion by mere scholastic attainments. I think to reward such attainments by promotion would be very objectionable for many reasons; but I do not see any objection to rewarding them by increased rates of pay. This is the only inducement to study which I can think of, which in the present state of our military institutions, and while the present system of promotion is maintained, seems the least likely to prove practically effective. Let us, for instance, say that an Officer devotes himself to the study of French, and is certified by an Examiner appointed by the Council of Military Education to have made himself thoroughly master of the language, that is, able not merely to read it, but to speak it fluently, and to write it grammatically. I should say this acquirement would be well worth a shilling, or even eighteen pence a day. This extra rate of pay I would grant, not permanently, but only for a limited period, say two or three years. At the end of this period, the Officers should be required to pass another examination, success in which would be rewarded by the grant of extra pay for another term. This would ensure knowledge, when once acquired, being kept up. To encourage the study of military history, and of the theory of the art of war, a similar plan might be adopted. Each year one or more campaigns and also a theoretical treatise might be prescribed for study, and an extra rate of pay granted for one year to all Officers adjudged by competent examiners to have made themselves thoroughly masters of the prescribed course of study. The study of mathematics, or the practice of drawing and surveying might be promoted in the same way. In fact, what I say is:—encourage excellence of every kind; encourage voluntary effort. Offer some suitable reward for the acquisition of any kind of knowledge or of skill in any art, which knowledge or which skill is susceptible of a useful military application, and which it is therefore desirable that Officers should possess. Possibly some merely honorary reward might be devised which would prove a sufficient inducement to promote voluntary study, such, for instance, as permission to wear the undress uniform of the Staff, or distinctive initials in the Army list.

The effect of such inducements might easily be ascertained by actual experiment. My own opinion is that a mere honorary reward would not prove sufficient. Officers would feel that money is the real test of value—that labour repaid only by a complimentary order or by some purely honorary distinction was in reality, labour lost—that their attainments, however great, whatever might be their intrinsic worth, had no real professional value. In 1844, on rejoining my regiment in Dublin after a two years' course of study at the Senior Department of Sandhurst, I was asked by the Commander of the Forces, Sir E. Blakeney, to make a survey of the Phœnix Park, on a scale of six inches to a mile. On completing my plan I showed it to Sir T. Larcom, who was then at the head of the Irish Topographical establishment. Sir Thomas laughed and said, "Yes; the plan is well enough done, and I dare say "you will get a civil letter from the Adjutant-General in return for it; but what "good will that do you? The authorities have no use for such things; they have "plenty of them, some as large as this carpet, some only the size of a sheet of note-"paper. They are all equally useless, and are only asked for as a matter of "form."

If there be any increase of efficiency, any real military advantage to be gained by inducing Officers to devote their leisure time to the acquisition of certain arts and

sciences, then that advantage must be worth paying for—must have a certain money value, be it more or be it less. Even a very small sum expended in the way I have suggested, that is, rewarding special attainments by extra rates of pay, would, I imagine, produce a very considerable effect in inducing a very numerous body of Officers to devote their leisure hours to study and to compete for the rewards offered.

There is one point, and only one, in which I totally disagree with Colonel Collinson. I think it a false principle to determine at the time a young man leaves school and receives his commission what his future career shall be; to say, "You have been dull, or you have been idle, or you have been dissolute and reck-"less; or, if not, if your abilities are good, if your conduct has been irreproachable "and your diligence exemplary, nevertheless, no matter why, you have failed; "A, B, and C, have passed a better examination than you have, therefore, henceforth "for ever they shall be first and you shall be last; you shall never compete with "them again. For the future, success is impossible, therefore exertion is useless. "The doors of the Staff College are closed against you; there is no avenue open "through which you may reach future distinction." Now, many a dull idle boy turns out an intelligent industrious man—many a worthless cadet an excellent Officer, nor are examples rare in which the reverse of this happens, when the promises of youth are not fulfilled by what is accomplished in after years. Therefore I say, let every Officer who receives a commission, be encouraged to exert himself. Let him who has been successful at school be encouraged to persevere; let him who has failed be encouraged to try again; let all be incited to work. Let the doors of the Staff College be always open to the first; let it never be too late to begin the race. Let the present system of selecting Officers for Staff appointments be maintained, and Colonel Collinson's proposal, rejected. More than that, we know there are only a certain number of vacancies on the Staff, and that there are not sufficient openings to reward every man who succeeds in the Staff College. Therefore, I think it desirable that every man who passes the final examinations with credit should, in addition to the chance of a future Staff appointment, have some certain present advantage. Allow him, for instance, to wear the undress uniform of the Staff, to have certain initials put against his name, and let him also have some substantial reward, eighteen pence or half a crown a day. Until appointed to vacancies on the Staff you might utilise the service of these men by employing them as regimental instructors. But, whether their services can be utilised or not, I think by the mere act of their having gone through a special course of study, and having prepared themselves to serve the country in the capacity of Staff Officers in any emergency, such as war, which requires an increased Staff, they have performed a real service, which is well worth paying for. I think it would be mere justice and a wise expenditure of money to give such men a retaining fee of two or three shillings a day. A little knowledge of accounts, a little knowledge of drill, a little knowledge of military law, all of these are absolutely essential, and instruction in them must be compulsory. But beyond these essential things, I think all work should be voluntary, and should be rewarded by extra pay. I would not attempt to say to Officers, who as a body dislike study and would not care to spend their time over books, "I insist upon your studying," unless I was prepared to reward them for their proficiency. Unrewarded study, if compulsory, would, I feel sure, degenerate into a sham. Moreover it is not necessary, nor even desirable, that every Officer should be a student. All Officers cannot be on the Staff. For leading troops, which is the chief and essential duty of a Regimental Officer, what we chiefly want are qualities not to be acquired by study, we want daring, pluck, and common sense, or rather what Colonel Collinson calls the imaginative faculty, quickness of perception, and readiness of resource. The very best Officers in the junior ranks do not want any theoretical knowledge for the perfect performance of their special duties: they want good nerve, good practical common sense, and daring. Let us utilise the talents of everybody. If an Officer is a student, let him be rewarded by Staff appointment suited to the extent of his attainments. If an Officer is averse to studious pursuits, but possesses qualities of character more valuable in war than

quickness of intellect and a studious disposition, actual service in the field will afford him abundant opportunities of proving his worth, and of acquiring distinction. Let such an Officer be rewarded by rank or honours proportioned to the value of the services he renders.

Captain MARSH, R.E.: There are one or two points I should like to mention which I hope Colonel Collinson will clear up in his reply. I cannot conceive that he means to propose, as it has been supposed by two Officers, and as this paper gives the impression, to limit the Staff appointments of the Army to those cadets who qualify in this school. I cannot conceive that he means that, nor, for one moment, do I believe that. Therefore, I hope he will clear that point up in his reply. Nor do I gather from his paper how Colonel Collinson proposes the examination should be conducted on leaving the school. I rather gather from what he says, that the three special branches of the Service, which he alludes to, should be open to those cadets of the school who qualify in special subjects. I do not quite understand whether he means that they should all meet together in a competitive examination, or that the cadets who are going for Staff appointments, should be examined in the particular studies he adverts to, or whether they should all study together and take rank accordingly. If he intends that, they should select one of the three branches, and then only those cadets be examined for their places in that particular branch of the Service. I think that would be well. But I think it would be unadvisable to examine all the cadets together, and then bring them out according to their places, 1, 2, 3. I think that is the great question in these establishments of a special nature. I do not think, under any way of looking at it, that it is desirable to have an inferior class of men in the line, and a superior class of men in another branch of the Service. I think they each want the best men.

It is quite a question whether the difference, which I believe is generally acknowledged, between Sandhurst and Woolwich, is not due to the fact that there is a stronger competition at Woolwich; there are the two distinct services; the Artillery and Engineers, and that induces competition. There are a number of cadets who go to Sandhurst, who never think of competing at all; and in that view there are a number of boys there who never do anything, and they get their commissions without purchase. I think that is a bad thing for Sandhurst, but it is very difficult to see how it can be avoided. The same kind of thing obtains in a less degree at Woolwich. I think all who have been at Woolwich will allow that there were a certain number, a very limited number, who felt that they should go into the Artillery, and who did not care very much about working,—they felt tolerably certain of getting into the Artillery. That was not a good thing. As regards the proposal to throw open the whole of the commissions in the Army to competition from the public schools, there cannot be a doubt that for the country in general it would be a great advantage. I think we must also look at the question from this point of view. Many Officers after they have served twenty years in the Army, go back into the country, and take their part as citizens in different walks of life. Therefore, to throw open three or four hundred commissions in the Army as premiums to the public schools of the country, would be a very great gain. In that view I think there is a great deal to be said in favour of electing to commissions in the Army from the public schools of the country.

Lieutenant-Colonel OWEN, R.A., Professor of Artillery, Royal Military Academy, Woolwich: I should like to say a few words after the remarks of Captain Farrell. There are several points which I might have alluded to, but it will be unnecessary for me to mention them now, because they have been so exceedingly well put by Captain Farrell, that it will be enough to say I entirely agree with him. But there are two or three points I should like to refer to, with regard to Colonel Collinson's paper, and also with regard to what has been said by one or two of the speakers. The idea of Colonel Collinson seems to be a school for the Artillery, the Engineers, and the Staff. I cannot help feeling myself that such a plan would cause a very great complication in any establishment devised for that object. At the Royal Military Academy at Woolwich, we have the Artillery and Engineers trained; and although they go through precisely the same course, there

is sufficient complication to create considerable difficulty. And I must say, as far as I am concerned, and I have no doubt there are a great number of Officers who agree with me, that it would be a great pity to separate the Artillery and Engineers at Woolwich. The services are so intimately connected, that every Artillery Officer must feel that he requires to have a considerable amount of knowledge of fortification. On the other hand, every Engineer Officer must feel grateful for what he has picked up at the Royal Military Academy in the way of artillery knowledge. Therefore, I consider it would be a great evil to separate the preparatory courses for these two Services. I consider the same course should be gone through for Artillery and Engineers at the same school. As regards the rest of the Army, I should be disposed, like Colonel Collinson, to trust to the public schools; and if it is thought desirable by the authorities, or whoever might have charge of the subject, instruction should be given to line Officers, after they get their commissions. I think this must be perfectly clear, that, if Officers joining any branch of the service are required to know military history, surveying, or subjects of this kind, it would be perfectly impossible to instruct them by twos and threes in different places; you must teach them together in certain classes at the Military Schools. With regard to the necessity of having a college for the Artillery and Engineers, one good argument in favour of such a course is this, that it is found necessary in every nation in Europe. Independently of that, I think there is so much special knowledge required for the Artillery and Engineers, that it would be very disadvantageous, indeed, to turn Officers into those services, not knowing anything at all about them. To take my own branch of the Service, the Artillery; in the Crimea we received a number of Officers direct from the Academy, and a number of Officers were sent out in the same manner to India during the mutiny. Now, it would have been most prejudicial to the service if they had known nothing of their own branch of the service when they came out. I say those Officers, coming out with a certain amount of training was a great advantage to the Service. With regard to the preparatory training for Woolwich or for Sandhurst, I should like to see more men come from the public schools. Everybody knows what inducements have been offered by raising the qualification in classics, and lowering the qualification in mathematics, to get boys from the public schools. It is the fault of the public schools themselves if they do not send more. There are certain examinations laid down for the Military Colleges; several public schools have formed special classes, and have been successful in sending boys to Woolwich and Sandhurst. I may mention Cheltenham, Marlborough; and there are others; why cannot the other public schools do the same thing? No doubt they would, if a sufficient inducement was offered. We heard the other day that the Head Master of Harrow intends to form a special class there.

Lieutenant-Colonel KEPPEL, Gren. Gds.: Eton already has a special Army class.

Lieutenant-Colonel OWEN: With regard to the state of the Military Colleges, I should just like to say one or two words. Constant complaints are made in a popular way as to the state of discipline, and so on, at these different schools. If there occurs a little outbreak, there is a hue and cry raised throughout the country, "What a dreadful place this must be!" If you were to apply the same rule to all the public schools in England, you would hear of mutiny and disturbance almost every day; because most of these so-called mutinies at the Military Schools are matters that would be passed over anywhere else. At Woolwich, I must say, as far as my own experience goes, I think the tone has considerably improved during the past few years. I do not know what the case is at Sandhurst; but with regard to Sandhurst, there are two very obvious reasons why you do not get such good results from it as you do from Woolwich. One is, that the young men have to be there such a short time; the other is, that they have not a sufficient inducement. Any young fellow knows that his friends can buy him a commission; therefore, why should he work? If that is the case, it is a very obvious reason why you do not get the good results you might expect. By keeping the young men longer there, and by not allowing anybody to pass through unless obliged to try for a commission, you might get better results. With regard to discipline, I must say this, I have been a certain number of years at Woolwich, and during the whole time I have been there, I have never

had the slightest trouble with the cadets. I am quite ready to admit that in steadiness on parade and that kind of thing they are not up to the mark that they were formerly. But as to gentlemanly tone, they are up to the mark. I have never received the slightest impertinence; they always behave exceedingly well, and are always amenable to orders. Compared with former years, there has been a great improvement. In 1846 or 1848 the Academy was in an exceedingly bad state. By two officers, General Parker and Captain (now Major-General) Wilmot, the discipline was, however, restored in the course of a few months; and as long as I was there we were always considered in a very excellent state as regards discipline. It is now very late, and although there are one or two other points, I think I have said all that it is necessary to trouble you with.

The CHAIRMAN: I am sure that we all owe a debt of gratitude to Colonel Collinson, not only for having written this paper, but also for the opinions that his paper has been the means of eliciting from different Officers present at this meeting. I have no doubt the discussion will be of very great use. At this late hour of the evening I will not make any further observations. I cannot pretend to answer all the questions that have been asked with regard to Colonel Collinson's opinions. I will, therefore, only propose that we return our thanks to Colonel Collinson for his paper.

LECTURE.

Friday, April 23rd, 1869.

General the Hon. Sir EDWARD CUST, K.C.H., G.C.L., in the Chair.

MILITARY TRANSPORT.

By Frederick Wingfield, Esq., Deputy-Assistant Commissary-General.

The question of "Military Transport," upon which I am about to address you, is I feel of such importance, that I venture to trust to your forbearance should I fail to do justice to my subject.

I would first endeavour to urge upon your consideration the imperfect manner in which this question has hitherto been appreciated, and the diminished importance that has been attached to land transport as an integral portion of our Army. The origin and progress of the establishment of regular transport; the recognition of the inseparable connection between transport and supply; the form of organization to be adopted; the authority to which the duty of controlling the train should be entrusted; and the description of transport to be maintained, will severally be reviewed and discussed in this lecture.

Except under the pressure of actual warfare, we have never until lately recognized in this country the existence of an organized Transport Corps, as an indispensable branch of any national force. In the wars that we have carried on in distant countries and colonies, special descriptions of transport have been extemporized for the occasion. At times wheeled transport or pack animals, at others boats and men have been employed for the conveyance of the necessary supplies. On the completion of the campaign, such transport establishments have been summarily broken up; and, until occasion again arose, the consideration of the principles which should guide our action, have been indefinitely postponed. To the days of the Peninsula and of Waterloo, a long period of inactivity succeeded. For 40 years we remained passive spectators of military progress in Europe, and when the Crimean struggle aroused us to exertion, we found ourselves helpless to create, and incompetent to administer those branches of the Service, which should have been matured in the repose of peace.

The rapid overthrow of Austria in 1866, and the admitted superiority

of the Prussian administration over that of their opponents, convinced all spectators of that struggle that radical reforms in their own armies had become imperative, and that their feelings of security were as mistaken as they were perilous.

In June, 1866, a Committee was appointed by the Secretary of State for War for the purpose of taking into consideration the subject of the arrangements to be made for carrying out the transport duties of an army in the field, in order that such measures should be determined on in time of peace, as would prevent the uncertainty and confusion which would arise on the outbreak of war, if the system to be adopted, had then to be settled.

To Lord Strathnairn and to the Committee under his presidency this country should ever be grateful, although years may probably elapse before we shall be able to appreciate the extent of the obligation. The exhaustive report submitted by them on the termination of their labours, and which embraced the more extended subject of military administration has proved the prelude to the introduction of the system of "control," which, while it follows the practice of all Continental powers, has been adjusted to the peculiar character of our own Service, and the principles of our Constitution.

It was the boast of our greatest Captain, that his Army, though small in numbers, could do anything, and go anywhere. No one ever impugned the former assertion, as true of to-day as of 50 years ago, but are any of us satisfied, as to the truth of the latter portion of the sentence? Can we possibly say that our Army is in a condition to go anywhere by a given time, or to attempt any operation independently of the gravest doubts as to our capabilities of movement? Are we as ready as our neighbours, and could we take the initiative, and have we any transport worthy of the name, either in men or material? Have we, in short, at our immediate disposal those means of conveyance, or (what is of more importance), the machinery by which they could be rapidly created, from which we might confidently anticipate success in the operations we might attempt?

To our insular position much of this national propensity to underrate the importance of "transport" may indubitably be ascribed. While we retain our supremacy as a Naval Power, or while our ability to cope at least on equal terms with maritime nations, is undisputed, we do not feel that insecurity, which is inseparable from a Continental status, where a river may be crossed, or an imaginary boundary may be overstepped, without further warning, than the angry menaces which precede the declaration of war. Our forces are not, and probably never will be, kept in that high state of mobilisation, which characterises the French and Prussian armies. We feel that before the note of war can be heard on our soil, fleets of transports must be collected, and an armada be gathered together, in which the enemy may attempt invasion; and even should these preparations have been completed, the Rubicon cannot be crossed, until our truly national force, our Navy, shall have disappeared. We know that such preliminaries require time for their arrangement, and we are not unwilling to postpone our preparations until the cloud is over us.

But in this unreadiness for action, in this state of inability to resist aggression, lie the elements of danger. Wars are not now conducted on the precise system of theory and method that once prevailed; rapid movement, decisive action, and energetic measures now characterize all military operations. The Army that is the most complete in equipment and organization must be the best prepared for rapid action, and will enter upon a war with every prospect of success. The struggles of 1859–1866 confirm the view, that a campaign may be a question of weeks and not of years, of days and not of months. Short as was the period for preparation awarded to the Austrians, shorter was the time of rest between each successive defeat, until their power collapsed before the energy and vigour of their enemies. And shall we not profit by that lesson? Shall we not learn that our very condition of unreadiness will be an incentive to aggressive measures on the part of our opponents, who will attack us because we are unprepared, who will assail us because we are unable to retaliate. The fact of our being unprepared cannot be disguised from other nations, they will find in our weakness an inducement to run counter to our views, and to risk the consequences of an opposition to our policy.

While few now contest the principle that an efficient transport should form an integral portion of an Army, the theory of the constitution and organization of such transport still forms matter for conflicting arguments. Some urge that the native transport of any country that we might invade, would contribute mainly to our help; while others would suggest reliance upon a train, to be raised and organized at the seat of war. Some proclaim the physical impossibility of sufficient transport being despatched from England to the seat of war, and all agree that had we an extensive train, we should be unable to find remunerative employment for it in time of peace. With a view to a happy combination of economy with efficiency, the transport must be so organized that while only sufficient for our immediate wants in time of peace at home and in the large garrisons abroad, it shall possess the elements of expansion to all possible requirements in time of war. In peace the nucleus, or embryo of a train, will satisfy our necessities, and economy forbids infringement on this rule, but the corps that shall be raised must be organized on the most elastic principles; contracted within the narrowest limits in time of peace, it must be capable of indefinite expansion and augmentation in time of war.

This theory has not yet been reduced to practice, but the opportunity has come, we are on the eve of re-organization, and an Army Transport Corps will shortly take its place in our Army List. While a subject of such national importance is under consideration, an enquiry into the origin of "military transport," and the influence it may have exercised in warfare, cannot be uninteresting or unprofitable.

It is to be regretted that so little information as to the manner in which the supply and transport duties were organized and conducted by the Generals of old has been furnished by military historians. No precise details are forthcoming, although we are aware that by several of such leaders (and we will mention Cæsar and Aurelian) they had been studied and reduced to system. The subject is, perhaps,

uninviting. The means of success are uninteresting in comparison with the end, which furnishes the brilliant themes to the historian or biographer. The anxious forethought and prescient care with which every detail shall have been calculated, every difficulty overcome, and the existence of the troops secured, before the great stroke of strategy can be played, must naturally fail to rouse the eager interest and keen anxiety that the description of the actual struggle and result can excite. Yet in a campaign, how few are the hours of battle compared with those passed in preparation. How short the time of actual conflict when contrasted with the long delays before successful combination can be ensured, and every possible exigency be anticipated!

The extent to which the consideration of transport can influence the action of a Commander, may be estimated, when we think of Xerxes with a train of baggage-waggons seven miles long for an army of five millions! Herodotus, to whom I am indebted for these statistics, and who does not enjoy the best of characters for veracity, may have been guilty of exaggeration, but if we remember what hordes of followers have ever been attached to Asiatic Armies, and also that the "crack corps" in the Persian Army "the Invincibles," were allowed to take with them into the field, their wives, slaves, and concubines, we shall modify our surprise, and ponder over the march of intellect, which forbids such luxuries even to our "slashers" and "die-hards" at the present day.

That Xerxes and Darius did maintain large armies in countries comparatively unproductive, and that at subsequent periods the hordes of savages, who overran these territories, did contrive to support themselves without difficulty, are facts that have been characterised by General Jomini as phenomena for which he was at a loss to offer an explanation. He could not discern that they appreciated the necessity of transport, while they notoriously disregarded the principles of administration.

The Greeks, according to Thucydides, were attended by slaves and beasts of burthen, for the conveyance of their provisions and necessaries. Philip of Macedon, however, compelled his troops to carry their own arms, provisions, and baggage, and allowed but one slave to every horseman, and one to carry a hand-mill for every ten foot soldiers.

Hannibal, who considered Alexander as the first of Captains, and who in his turn was held by the Duke of Wellington to be the greatest military genius of old, attempted to rise superior to considerations of supply and transport; the loss of two-thirds of his Army convinced him of his error.

The perfect organisation of the Roman Armies, and the excellence which they attained in administrative science, effectually precluded the possibility of failure as far as transport was concerned. While Cæsar proclaimed the doctrine that war should support war, he studiously reduced the impediments of a baggage-train by the formation of depôts in each conquered province. The Romans were essentially road-makers, as the vestiges of their skill attest to this day, and they realised the value of good roads as the means by which they could retain their hold upon the provinces they had subjugated. Efficient transport necessitates attention to the means of communication; good roads enabled

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them to accumulate supplies in every direction, and to provide against the contingency of disaster or want; but the excellence of the roads also enabled the Roman soldier to march excessive distances under enormous loads, and at times to carry his provisions almost independently of the aid of transport.

We are told by Froissart that on one occasion, when King Edward III invaded France he was accompanied by a train of 6,000 waggons, which extended for two leagues. As the district which he traversed had been repeatedly ravaged and become impoverished, King Edward could not have ventured to rely upon the resources of a country in such a plight, but had the province he invaded been prosperous and highly cultivated, he would not have hesitated to support himself by exactions and rapine.

It is, of course, hopeless to seek for traces of organized transport before the time when the advantages of systematic administration were appreciated. In the middle ages, while clemency to an inoffensive population was derided, and the impolicy of an exhaustive system of plunder was not recognized, pillage was encouraged by the leaders, as the most convenient mode of supplying mercenary troops. Transport was not required for supply services on their account; they took what they wanted, and as it could be got. Ambulances had become obsolete since the Roman Empire. The material of war had not then developed to the proportions it has attained in modern days, and such transport as was required could be obtained by the appropriation of the carts and animals in the vicinity. The inhabitants had the option of surrendering their property or their lives. Friend and foe were equally indiscriminate in their exactions, and the wretched peasants were the victims of either party.

With improved weapons, superior tactics were introduced. Complicated operations and subtle combinations, involve due regard to considerations of subsistence. Before troops can be condensed upon a given point, or simultaneous movements can be made upon a given day, administration must have contributed its aid. The functions of "transport" in facilitating this end were by degrees developed into the semblance of a system.

In the time of Queen Elizabeth, an Officer, styled "the Waggon Master General" not only exercised direction over the transport of an army, but also held supreme sway over those ladies whose attachment to the service induced them to forsake the towns for the attractions of a military life. He was empowered, according to Sir James Turner, to classify these ladies, with due regard to the rank of their husbands, and although the regulations of the service were imperative as to the necessity that every woman who accompanied the Army should have a husband in it, there are such extraordinary allusions to the punishments which might be inflicted, and such disparaging expletives applied to certain ladies, as to leave little doubt upon the easy tone of morality that existed in our camps.

In the Thirty Years' War, owing to the luxurious habits of military men, and the numerous retainers and women who accompanied them, the amount of baggage had increased to an extent that would

appear incredible at the present day. In the Imperial Army, the allowance of baggage waggons exceeded that in force in either the Danish or Swedish forces, but 1,000 waggons for 5,000 cavalry and 100 for their sutlers, was not considered by the great Gustavus as an excessive proportion. In the time of Henry IV of France, one horse was told off to carry the baggage of four soldiers, and one, for that of two light horsemen, or archers. A boy or goujat was allowed to wait on every two soldiers, so that for an Army of 10,000 infantry, 2,500 animals and 5,000 boys were required. These boys are energetically characterised by Sir James Turner as "the very vermin of an Army."

Up to the close of the 18th century, the transport services of European Armies were mainly performed by contract. The contracts for supplying the great Duke of Marlborough, in Holland, were entrusted to Dutch capitalists, as we gather from his despatches; and during the Seven Years' War, a Mr. Oswald was for some time the superintendent of the English and Hessian waggon trains, which would appear to have been so ill-managed as to have most materially impeded the operations of the Allies. The French Armies were in no better plight. Impressment and requisitions upon local magistrates but too often failed to supply the deficiencies of their contractors. Carriages and harness, provisions, fuel, and forage, and advances of money, were furnished by the French Government to these men. Young soldiers were lent to them to act as conductors; but the principles of order, regularity, and discipline were so gravely affected by such arrangements, that at the close of the war, the formation of an organized train had been decided on.

The same feeling was in existence in this country. The repeated complaints of Prince Ferdinand of Brunswick as to the inefficiency of his transport service, suggested to our Government the propriety of an established train. A Treasury minute of 1762, refers to an offer of Mr. Dundas, then contractor for waggons in Germany, to transfer to the Government his waggons, 500 in number, with horses and drivers complete, for the sum of £88 10*s.* each, it having been for the first time proposed to form a public transport establishment.

In the introduction of this reform we appear to have anticipated the French. In 1794 the "Royal Waggoners" were established. This corps was composed of 9 troops, of 60 rank and file each. The Officers were chiefly taken from the half-pay list of the reduced cavalry corps, and the men and horses almost entirely from the regiments of fencible cavalry that did not offer their services as volunteers. This experiment terminated in utter failure. The inefficiency of this corps became too notorious to allow of its protracted existence. The train was sold, and every purchaser of not less than twelve waggons was admitted to the advantages of a contract for the number of waggons which he had purchased.

The Royal Waggon Train created by the Duke of Wellington became eventually most efficient, but as it was attached to the Quartermaster-General, and was principally, if not entirely, composed of spring-waggons intended for the conveyance of the sick and wounded, their services were not generally available for commissariat duties. In 1812

a train of commissariat carts, each drawn by two bullocks, was organized, and proved eminently useful, but the great portion of the transport required for the conveyance of supplies was still obtained by contract and hire, in compliance with established custom.

In proof of the extraordinary attention bestowed by the Duke of Wellington upon every subject connected with the administration of his Army, I must allude to the three memoranda prepared by him, and forwarded to Sir Robert Kennedy from Grenada in November, 1811, containing his instructions as to the formation of a bullock train of 800 carts, which should be fitted with axletrees and brass boxes taken from the French carriages. With rigid exactitude the Duke enters into the most minute details as to the number of animals, the strength of the establishment, the rates of pay, the rations for man and beast, with the stages to be accomplished daily. He lays down the precise distances which the mules should travel, the number of leagues which should separate magazines from depôts, and the time that should be occupied upon each service. No detail appears to be beneath the grasp of an intellect which could at once comprehend the most extensive operations, and the smallest minutiæ of each special department.

In countries friendly to our cause and materially interested in the operations we had undertaken—in Spain and Portugal, for instance—we should naturally expect that great facilities would have been offered to our administration. But the defects of an imperfect system were ineradicable. Uncertainty and unpunctuality resulted from these contracts, and indifference and disobedience argued the necessity for that control which discipline alone could give. To what extent our operations were impeded, our triumphs nullified, and our cause jeopardised from want of transport, the despatches of the Duke of Wellington will best prove.

In 1809, after the battle of Talavera, the Duke addressed the following remonstrances to Lord Castlereagh:—"I have not been able to "follow the enemy as I could wish, on account of the great deficiency "in the means of transport with this Army, owing to my having found "it impossible to procure even one mule or a cart in Spain.

"I am doing everything in my power to procure for the Army "means of transport and provisions. I hope I may get some of the "former that may reach me in three or four days, and in the meantime "my Army may get something to eat."

On the 31st of August, in the same year he wrote to Mr. Frere, "I positively will not move, nay more, I will disperse my army, till I "am supplied with provisions and means of transport, as I ought "to be."

In 1811 the Duke wrote from Villa Fermara to the effect, that he had no transport, had been compelled to send back guns to Madrid, and to pick up French shot in his camp, in order to make up ammunition for Arentschild's guns.

In the following year the Duke of Wellington reports from Ciudad Rodrigo to Lord Liverpool, 23rd of November, 1812: "I had ample "means at Madrid and Santander for the siege of Burgos, but what "was wanting at both places was means of transport. The people of

"England so happy as they are in every respect, so rich in resources "of every description, having the use of excellent roads, will not "readily believe that important results here frequently depend upon "50 or 60 mules, more or less, or a few bundles of straw to feed them; "but the fact is so, notwithstanding their incredulity. I could not "find means of moving even a gun from Madrid."

Hampered with difficulties in procuring transport, the Duke was further subjected to repeated annoyances from the national antipathy of the Spaniard to the Portuguese. The Spanish muleteers, whom the Duke described to be "the lever of the Commissariat," refused, in 1811, to carry provisions for our Portuguese contingent. Not one of those men would willingly carry an ounce of food for the Portuguese soldiers, and had they known that the supplies on their mules were destined for the race they so heartily despised, they would have thrown down the loads, and driven away their animals in disgust. The feelings of these muleteers must, however, have been sorely aggravated by the tightness of the money market; the arrears of pay due to them owing to the want of money in the military chest were so considerable, that in July, 1812, the Duke reported that they had received no pay for 13 months.

Great difficulties were also experienced from the disgraceful conduct of our troops. In 1810, the Duke at Pero Negro refused to allow the convoys to be escorted, as the Spanish muleteers, who performed the greatest part of the transport service of the Army, would not submit to the brutal violence of drunken English soldiers, and would infallibly desert with their mules, if escorted by troops; and he expressed his belief that the delays which the drunkenness and irregularities of the troops would have occasioned in the arrival of the stores, and the loss by their own thieving, would have been found far greater than those experienced through any dishonesty of the muleteers.—(Letter to Horse Guards, November 2, 1810.)

Had a lesser authority than the great Duke recorded these incidents so discreditable to our national character, we should be incredulous as to their truth, but in 1810, he wrote as follows:—"A detachment "has scarcely ever gone as an escort with carts, even carrying treasure "or sick, that the soldiers have not taken bribes from the drivers to "be allowed to quit the convoy with their carts and bullocks. This "*practice* leads to fresh irregularities. To supply the deficiency of "transport, carts must be pressed, and to avoid this contingency the "country people will bribe the soldiers, so as to escape the inflic-"tion."

If then the difficulties which I have enumerated could be the results of want of regular transport in countries where we enjoyed the unusual advantages of numerous animals, extensive credit, and a friendly population, what might we not have anticipated under less favourable circumstances?

The armies which the French Republic poured into Holland, Italy, and towards the Rhine, found little difficulty in supporting themselves in the midst of plenty in such favoured regions. The rapid and successful movements of Bonaparte and the French generals opened up

fresh countries with unlimited resources for the subsistence of their troops. Transport was not needed with tactics such as theirs. And in 1805 Napoleon proclaimed to the army advancing upon Ulm, that each General must provide for the subsistence of his troops, as no considerations of administration could enter into his plans. As war progressed, and the enormous armies then on foot became daily more dependent upon their administration, the Emperor Napoleon determined upon the formation of an organized Army Train. In his decree of 1807, he stigmatised as an absurdity the popular estimate of a contract as a lottery, whereby an honest contractor might be ruined, or become a millionaire, though idle and indifferent. "Military transport," he argued, "is as necessary to me as the Artillery Train, and should be as little "dependent upon chance."

With Napoleon, to speak and act were one. In the same year he raised the corps of *Equipages Militaires*, which in 1812, at the time of the Russian campaign had swelled to 22 battalions of 6 companies each. Napoleon calculated that 500 waggons should suffice for an army of 40,000 men, and he asserted that, with this number and the assistance of the regimental pack animals, and what the troops themselves could carry, he should experience no difficulty in providing himself with provisions for one month.

In 1813, a battalion of 10 companies was raised for special ambulance service; to each company one of hospital orderlies was attached. At the close of the great war, when reductions were compulsory, the *Equipages Militaires* were reduced to one squadron; but on the outbreak of war with Spain in 1813 (after all attempts to create a civil train had proved abortive), 22 brigades were hurriedly raised on a purely military footing, and dispatched into the field. Although imperfectly and crudely organized, yet manned and officered by French soldiers, they rendered efficient service; but on the declaration of peace in 1824, the French Government in their anxiety to avoid the errors of their predecessors, decided upon the retention of a small establishment, which should prove the principle or nucleus of a train capable of expansion to a war footing before war should actually break out.

The successful issue of the campaigns in Algeria may be attributed in great measure to the excellence of the transport arrangements introduced by Marshal Bugeaud. The French Generals proclaimed that the first and noblest mission of the train was to convey the sick and remove the wounded from the field of battle. To the caçolets and litters which accompanied the advancing columns, Marshal Bugeaud boasted that he owed his victories. While he stimulated the ardour of his troops, and urged them to renewed exertion, he inspired them with the confidence that the wounded would be the objects of his solicitude and care, and when the submission of the native tribes completed the triumph of his arms, he did not hesitate to assert, "Que le courage de nos soldats n'aurait pas suffi peut-être pour la "conquête de l'Algérie sans la possibilité de soustraire aux Arabes "nos blessés et nos malades."

The complete re-organization, and the final constitution of the *Equipages Militaires* were reserved for the present Emperor, who on

the recommendation of Marshal St. Arnaud, established the service on its present footing.

When the Crimean war burst upon us, we were as unprepared for action, as ignorant of the necessities of the occasion, and of the requirements of an army in the field, as our allies were ripe and ready for the emergency. We dispatched from our shores, batteries of Artillery, regiments of Cavalry and Infantry, with companies of Engineers, and we flattered ourselves that we had sent forth an Army against our foe. Unfortunately we overlooked the services of transport and supply. The Train which should have been organized in anticipation of the struggle, and which should have accompanied our Army on its landing in Turkey, did not exist; it had been forgotten or neglected till it was too late. The Army arrived at Varna, and appealed to Omar Pasha for that assistance in waggons and pack animals, which they then discovered that they should require; 2,000 waggons and 1,200 mules were estimated as indispensable for our wants in Bulgaria, while, if the Army were to invade Russia, 14,000 animals would be required for our transport!

Such negligence, after the bitter experience of previous wars, is to this day inexplicable! It is difficult to credit that an English Army should have thrown itself upon an enemy's soil with no larger general transport than what some seventy animals and a few carts could supply, and that it should have risked destruction upon the chance of a successful foray upon the resources of a country in possession of the enemy! By the 18th September we had captured a few arabas, which were distributed among the divisions and Staff Officers according to the scale fixed by a general after-order of that date. With unconscious irony our available transport is described as "extremely limited," and in the partition of these few waggons, the wants of the supply departments were overlooked. The sequel to this improvident commencement is but too familiar to us all; but let us remember that the disasters entailed upon our Army were of our own seeking. The fabulous expenditure, into which we plunged in our futile efforts to extemporize a transport, was but the chastisement of our short-sighted economy during the past, and in the undisciplined rabble whom we hired into our service we read the lesson, that we had already been taught, but had forgotten, as to the necessity for training and organization.

30,000 men, 4,200 horses, and 180 guns, were landed at Old Fort without even the pretence of any transport for their supplies. A few mules for the conveyance of the first reserve of ammunition did accompany each division into the field, but the Army that could not have marched from Varna to the Danube, that could not have moved, as an Army should operate, beyond its own camp, was launched upon the Crimea without an ambulance for its sick, without, I may say, a vehicle for a bag of biscuit, or a waggon for its ammunition and tents. Misfortunes followed fast; sickness, disease, and famine, wrought havoc among man and animal—one calamity entailed another, each difficulty but suggested a fresh dilemma. Had there been roads, we wanted beasts, had there been beasts, we required forage; the absence of roads, destroyed the animals, while the

want of men, made it impossible to repair the roads. In sight of plenty, famine reigned supreme. The Frenchmen lent us litters for our sick, and gave their men and waggons to convey our shot and shell, but gradually we succumbed to the self-imposed burthen, and our spasmodic efforts failed to extricate us from the mire.

On the 30th of September, 1854, 76 horses and mules composed the transport in charge of the Commissary-General. On the 16th of January, 1855, the returns showed a strength of 333 pack animals and 12 camels as the effective transport at his disposal; yet upon the termination of the war, we found ourselves with a Land Transport Corps and some 28,000 animals, 800 waggons, 1,100 carts, and 14,000 English and native drivers, indispensable adjuncts to our Army before Sebastopol.

And yet with this enormous throng of men and animals, and with the entire command of the sea, that our Army could have assumed the offensive, and have penetrated into Russia, with their base upon the Black Sea, I not only doubt, but am prepared to deny. *Our transport was valueless*, owing to the description of hired drivers and attendants of which it was composed. The leading periodicals of the day had encouraged the delusive idea that a transport could be extemporised, and that numerical strength was identical with the efficiency imparted by discipline and organization. With immature haste we hired into our service every available scoundrel in the East, we amassed thousands of animals and tons of equipment, and then attempted with a handful of men and Officers to reduce this rabble into a system, this mob into an organized establishment.

An Army cannot act upon the offensive until a base of operations shall have been secured. By us such base must be obtained by a descent upon some selected port or coast. From that base an Army cannot advance unless furnished with the means of transport, whereby the subsistence and supply of the troops are assured beyond the chance of failure. An English Army must land its transport with the troops; it cannot rely upon the advantages that a Continental power may possibly find at its disposal, but must anticipate all wants by a sufficiency of efficient transport. An Army unsupplied with such, is powerless both to advance or retreat; unable to secure the removal of the sick and wounded, such a force will be also unable to accept the advantages which defective strategy may present. With an efficient train it can be directed upon any point, it can be fed, clothed, armed, and recruited, and if compelled to retreat, can retire without loss or disorder.

Troops cannot live or fight without food or cartridges, and Lieut.-Colonel Reilly has reminded us that on many occasions the latter are of most importance. On one occasion in the Sikh campaign we were in imminent danger from a deficiency of ammunition; and in the Spanish-succession-war, 10,000 English troops were compelled to lay down their arms from a similar reason. When movements are rapid, engagements serious, and operations successful, the more dependent must be the General upon the ability of his transport to facilitate his measures and to co-operate with his advance.

The Land Transport Corps, which had been created in the spring and summer of 1855, was broken up on the conclusion of the war; and in

the ensuing year, the Military Train was established as a permanent addition to our military force. We did not adopt the practice prevalent in Continental Armies, of placing the Train under the orders and at the disposal of the Officers responsible for supplies. It is true that at the period in question the supply services were not consolidated under one head, but it was not intended that the authority of the Commissary-General, which had previously been recognized, should be extended over the new corps. The Military Train was established, as it should be, on a military footing, but the principles of its organization were unsound. The Corps savoured too strongly of cavalry, and too little of the Train. Driving was a secondary consideration to drill, and the practical utility of a waggoner was lost in the trappings of a dragoon. Embodied as a purchase corps, into which Officers could exchange at their convenience, the Train became an attractive service to moneyed men, who could purchase promotion over their less wealthy brethren, and then leave the service for one more congenial to their tastes. Officers and men were not selected for a branch for which special qualifications and aptitude should have been required, while a general misunderstanding as to the duties and object of the service appeared to influence all ranks. Equipped and armed as cavalry, the train resented that they should be considered as carriers for the Army, but failed to define, to the satisfaction of others, what their legitimate duties were supposed to be. They were intended to be the "nucleus" of an Army transport; this sonorous term, which suggests much, is more theoretical than practical. This "nucleus" was to be so elastic, so expansive, that each troop was supposed to be capable of being developed into a battalion, each battalion into a division of disciplined transport, adequate to every want, and equal to all emergencies in time of war. But such hopes were not destined to be realized.

When it was decided in 1859 that an expedition should be dispatched to the North of China, to avenge our disaster on the Peiho, a battalion of the Military Train was sent out for service under the orders of the Deputy Commissary-General. This battalion was to form the basis of a Transport Corps, to be raised and organised on the spot, and in which the Officers, Non-commissioned Officers, and men of the Military Train should exercise command and superintendence, and should instruct the native drivers in the execution of their duty. It was proposed to raise a corps composed of 4,500 animals, horses, bullocks, mules, and ponies, with a proportion of four-wheeled waggons and Maltese carts, and 1,500 Chinese, Indians, and Manillamen as attendants. Each private soldier of the Military Train would act as overseer or superintendent to some 30 animals and 10 native drivers, while the higher duties of command and discipline would devolve upon the Officers and Non-commissioned Officers of the Train. To Assistant Commissary-General Bailey, C.B., the organization and direction of this transport were confided by Lieut.-General Sir Hope Grant, in conformity with his opinion that the Commissariat should have unrestricted control over the transport.

The experience of a few months sufficed to convince the Commander

of the Forces, that the removal of the Officer in command of the Military Train was indispensable to the creation of that feeling of co-operation and unity between the two branches of the service, which could alone ensure success. The officer in question resented the idea that he should serve in a subordinate capacity to one who was non-combatant. And in view of the danger of such misunderstandings, through which the service might have collapsed, the Commander of the Forces decided that he should be summarily relieved of his command. No further serious difficulties were experienced after the departure of this officer, but in addition to this transport, a corps of 3,000 coolies had been formed in the south of China, and arrived in the gulf of Pecheli with the troops. Two coolies would, between them, carry a hundred-weight, suspended from a bamboo upon their shoulders. Divided into companies and sections, under the command and direction of English Officers and soldiers, these coolies proved eminently useful, but their propensities to plunder and to loiter on the line of march, gave ample occupation to the Provost-Marshal and his assistants.

The campaign was brought to a satisfactory conclusion, and many may say, "all's well that ends well." But the experiment proved unfavourable to the "Military Train" as the motive power of an army. The opinions of Generals and Staff Officers were alike condemnatory of its organization, and all were impressed with the anomalous position which the Train held in its relations with the supply departments. If the Officers of the Train disliked or misunderstood their duties, the men were not likely to be zealous in the cause. They were well drilled and smart-looking, but they had never been taught how to pack an animal, or how to load a cart. The animals suffered while the attendants were indifferent to their wants, and the baggage was destroyed or damaged through the carelessness of those who should have superintended its conveyance.

In the ensuing year, on the expectation that the "Trent" difficulties would induce a war with America, troops were hurriedly despatched to Canada. A Commissary-General and the Commandant of the Military Train were sent out on the understanding that the whole transport of the Army was to be provided by the Train. On their arrival at Halifax however, the Commissary-General was requested by the General Officer Commanding, to make all the transport arrangements for the conveyance of the entire force, *including Military Train*, through New Brunswick to Canada, and to the various posts in Canada, to be reinforced. The whole arrangement had to be organized and set in motion in a few days, and it was carried out without one mishap, though the Commissariat staff in Officers and men for the whole of the duties, INCLUDING TRANSPORT, were actually fewer in number than the Military Train, destined for the performance of transport alone.* The secret of such success lay in unity of action. Transport money and supply were under one direction; and one head, an extremely long one, organized and carried out the arrangements for this long and

* Memo. by Sir W. T. Power, K.C.B., Commissary General-in-Chief.

perilous march. Command of money levelled all obstructions in his path, he created what he did not find at hand, he provided transport for every want, and eventually conveyed the very Train that was dispatched to Canada for the purpose of conveying him.

In the ensuing year, 1861, the difficulties in New Zealand entailed a war upon an extended scale. A force of 10,000 troops was despatched to that country, and Sir Duncan Cameron was appointed to the command. As usual, the transport had to be created—none was sent from England—and to the officer who had distinguished himself in this capacity in China, the duties of the formation and direction of this branch were committed.* The military stores at Auckland were not extensive or varied. Twelve pack-saddles and three sets of double harness can hardly be considered a comprehensive stock from which an efficient train could be equipped, had they even been of good material and workmanship. But unluckily the leather was rotten and the packs were valueless. The Director, however, rose superior to such difficulties. In time, under his superintendence, a transport establishment was organised, comprising 1,534 officers and men, 1,516 horses, and 728 bullocks. The Officers and men were transferred from the Line, and the Colonial Militia regiments. The carriages were two-wheeled, light town-drays, without springs, purchased at Sydney, and drawn by horses; while the bullocks were accommodated with drays of the same description, but of heavier build. The horses were procured from Tasmania and Australia, and all the pack animals were eventually provided with the Otago pack-saddle, which has proved immeasurably superior to every other description of pack-gear. Equally adapted for riding or pack-purposes, this saddle can sustain a heavy load, which neither slips nor galls the horses' backs, as all other patterns have been found to do. The service ambulance waggons, which were unsuitable for the country, were replaced by light American waggons purchased on the spot.

As the force advanced into the Waikato country, and the duties of the inland water transport devolved upon the Commissariat, when the Royal Navy were compelled to reinforce the troops, three companies of boatmen were at once raised and organized from colonial resources for this arduous and unexpected duty. Boats of special build and shape were constructed upon the diagonal principle, after the designs prepared by Mr. Bailey. They carried from 10 to 12 tons weight of cargo, in two feet of water, and were propelled by 16 oars or sweeps. This water transport proved of incalculable benefit; and as the entire duties of supply, both of food and transport, were conducted under one department, the two services were thus blended in harmonious action, which entailed regularity and ensured success.

In February, 1864, the fourth battalion of the Military Train arrived in New Zealand. It was arranged that it should undertake the transport duties at Auckland and the vicinity, while the remainder of the line, some 150 miles, should be served by the Commissariat Transport Corps. The importance of the duties entrusted respectively

* Assistant Commissary-General Bailey, C.B.

to the two departments can be estimated by this striking contrast in the limits of their operations; but the comparison of their relative responsibilities can better be appreciated by the observation that in Mr. Bailey's corps, each division of 210 animals was placed in charge of three Officers, while in the Military Train that same number was employed with each troop of some sixty horses.

Of the transport arrangements in Abyssinia I will not presume to speak, as the incidents of that campaign will form the subject of a lecture to be delivered shortly by a distinguished member of this Institution.

While it is impossible upon economical grounds to maintain in time of peace a military transport, available for every service of supply and conveyance, and adequate to the requirements of a large Army in the field, *the doctrine which would advocate extensive reliance upon purely local transport, hired or purchased at the seat of war, is, in my opinion, a dangerous delusion.*

If the enemy had but timely knowledge of our approach, the country would be promptly cleared of all descriptions of transport, as proved the case in China; as the Russians invariably attempt to do; and as the Austrians should have done in the war with Prussia. But on the presumption that native carts and animals could be obtained, could we secure efficient drivers and attendants? Could we *improvise* on the moment a system which should ensure punctuality and precision in the delivery of stores? From what sources could we obtain persons qualified to organize and reduce an undisciplined, perhaps unwilling, body of peasants, ignorant of our habits and impatient of control, into an efficient corps, divisible into detachments, under proper superintendence? What number of soldiers would not be required to keep guard over such rebellious servants, and to prevent the mutiny and desertion which have always characterized these levies; what amount of bayonets would not thereby be lost to the combatant portion of the Army; and of what use are untrained Non-commissioned Officers and men borrowed from regiments, when placed in charge of animals and drivers, whose characters and peculiarities they invariably misunderstand? Such a transport is little more than a miscellaneous mass of material, without vitality or cohesion.

Men, taken haphazard from regiments for a day's job, as Sir W. Power has observed, cannot be expected to comprehend or care to do all that is required. They have to get a disagreeable task done, and to return to camp—the most obvious means of accomplishing both, are to hurry the cattle and drivers by blows and threats. The necessary result ensues, the cattle are worn out and perish, the drivers desert, and the transport is destroyed.

Such hired transport never has yet given, and never will give, mobility to an Army. Regular Transport under military discipline, supplemented by an organized auxiliary train, can alone attain this end. When our regular Transport is to be expanded by the assistance of the best material we can obtain, *the auxiliary transport to be raised must be manned and officered by Englishmen.* From the regular

Transport Corps we shall obtain a proportion of Officers, Non-commissioned officers, and men, who will instill into the new levies those principles of discipline and subordination, with which they themselves are animated. This process of expansion must be set in motion on the first menace of approaching war, so that when hostilities do commence, we may find our transport already on a war footing, prepared for work, and commensurate with the requirements of the force which we propose to send into the field. We must no longer court disaster by sanguine expectations that transport will be procurable at the seat of war. Some animals may be obtained near our base, but *carriages and horses, and, above all, efficient English drivers, must be despatched from England, and should land with the forces on their arrival at the scene of operations.**

The regular Transport Corps should be composed of men and Officers of unusual intelligence, and of special aptitude for the service. Highly trained and disciplined in time of peace, each Non-commissioned officer and driver *must* be qualified for superior rank in such auxiliary transport as may be levied at the time of war. No reliance can be placed upon hired native drivers or conductors, as the French discovered to their cost in the Crimea. Insensible to any feeling of honour, or of regard for the master whom they have engaged to serve, such civilians resent the restraint of discipline, and either abandon their charges or desert to the enemy. Expediency would also suggest another reason why an invading army should as much as possible abstain from interference with the local transport of the country. The supplies of forage and other necessaries for the troops can most easily be collected through the agency of contractors. The intervention of such people will be facilitated, if the transport of the country be left at their disposal, but all beneficial action on their part must be arrested, if the carts and animals in the district should be impressed into the service of the Army, and the peasantry be denuded of all means of conveyance.

As it is indispensable that regular transport should form a component part of every army in the field, so is it equally necessary that such transport should be organized and disciplined in time of peace, and be modelled upon a military footing. The results of past wars have convinced the great Continental Powers of the necessity of this precaution. Our Indian experience is also confirmatory of this view. Hired transport was denounced in 1800 by the Duke of Wellington, as "unsuited for light detachments, or, indeed, for any body of troops "which is obliged to move to any distance; and the expense which is "incurred affords no security that the troops will enjoy, in the moment "of need, the advantages of the stores and supplies for which the "carriage is provided."

As a further instance of the inefficiency of hired transport, I shall quote the letter of the Duke of Wellington to Lord Liverpool in explanation of the delay that had occurred in the investment of Ciudad Rodrigo:—

* The miscarriage of Sir J. Craig's expedition, in 1805, was attributable to the want of efficient drivers.

"Gallegos, 7th January, 1812.

"After every allowance is made, we must expect disappointments when we have to deal with Spanish and Portuguese carters and "muleteers, and therefore I cannot invest the place until to-morrow.

"What do you think of empty carts taking two days to go ten "miles on a good road! After all, I am obliged to appear satisfied, "or they would all desert."

Such was the opinion entertained by the Duke as to the merits of the Spaniards and Portuguese, who are acknowledged to be the best muleteers in Europe or elsewhere.

In 1860, Sir Charles Napier thus expressed himself upon this question—"I am convinced that the baggage of an army can never "be rendered properly movable, even in Europe or America, still less "in India, unless it is formed into a corps perfectly organized. Such "a project applies to every country, every army, and every climate. "It is a general principle by which most difficulties regarding baggage "may be removed, and all of them reduced and made comparatively "trifling. The baggage of an army is perfectly susceptible of being "reduced to order, but for that purpose a rigid organization must be "established." He then proceeds to depict, in graphic language, the scene of turmoil and confusion which invariably occurred on the morning of the march. As it was in his time, so was it in the campaigns of Lord Strathnairn, who attributed the delays and difficulties he encountered in 1857 to the unorganized hired transport, with which his Army was supplied. He has described the confusion and embarrassment of the march, the waste of valuable property, the excesses and outrages of the ruffians who composed the train, and the dangers to which the communications, safety, credit, and discipline of his Army were continually exposed.

The control of the Transport should always be entrusted to the Officer who may be responsible for the supply of an Army in the field. It is obviously inexpedient that any division of authority over any branch of the service should exist, and experience has fully demonstrated that this principle is peculiarly applicable to the transport. The successful execution of the duties of supply are entirely dependent upon command of transport; if this command be withheld from the supply branches, it follows that responsibility cannot be exacted from them in case of failure. If the administrative departments are to be united under one head, and to that one person the duties of supply are to be confided, to him also must complete authority over that essentially administrative branch, the Transport, be unreservedly conceded. It may be easy to obtain the material for a train, but no one will manage it or husband it so well as the person who must look for his own success or failure in the manner in which that train is administered. Upon the recommendation of Lord Strathnairn's Committee, the direction of the whole of the Army transport is to be entrusted to the officer at the head of the administrative Staff of the Army, and to him will all requisitions for such transport as may be required for special services be addressed.

The principal duty of the Transport is for services connected with

the supplies and stores of an army. While the entire Transport is maintained in one body, under one head, and proper portions of it are detached, as occasion may require, for each division or regiment of an army in the field, and which detachments upon the completion of this service will return and become available for other duties, it is clear that great economy of labour is secured, and the work is divided amongst the entire Corps. If on the other hand, fractional portions of the Transport are detached from the force, and are specially and permanently transferred to Divisions, Brigades, and Corps, it is evident that by such arrangement some portions of the Train will be overworked, whilst others for a long period remain inactive, and are practically useless. It is impossible to precise the exact amount of transport that any portion of an army will require, until the locality it may occupy, the nature of the roads, and the distance from the magazines shall have been taken into consideration. One Division may have more than it requires; another may be isolated, and not have sufficient; in one the Transport may be idle in the vicinity of the stores and magazines, in the other the animals may be worn out with fatigue, whereas, if the entire transport be under one officer, he would allot to the applicants a proportion equal to their wants, and as it might be required. With the exception of the Siege Train, which, as a component part of the Royal Artillery should be amply provided with special carriages and horses of sufficient size and power for the conveyance of its material, there should be no separate transport trains, as many Officers of the Royal Engineers have advocated. The horses and drivers for such duties require no special training, and the occasions for their employment are not so frequent as to call for separate establishments. A horse that will draw a bread-waggon will drag a pontoon carriage, and the Train soldier who can drive a store-van is equal to the responsibility of steering an Engineer's cart. Special carriages are indispensable, but they should be horsed and driven by the Train.

The time during which an army is in movement, will usually bear but a slight proportion to that spent in comparative inaction, during which it will not require transport for its munitions and material of war. Employment for the Train can, however, always be found under all circumstances by the Supply Departments, as food and forage are a daily and indispensable requirement. Stores must be accumulated, and a division of labour amongst the entire transport will reduce the strain imposed upon the animals, and expedite the service, while we should remember that the nearer to the magazines the Train is encamped, the greater will be the economy of labour in the consequent diminution of transport for its own provisions, forage, and material.

In Prussia, as we are informed by Lieutenant-Colonel Reilly, in his able memorandum on the war of 1866, military transport is arranged upon the principle, that every portion of the Army has its own transport. Be it a squadron, or a battalion, a brigade, or a division, each body is supplied with means of conveyance for their ammunition, baggage, clothing material, arms and accoutrements, food and forage, besides transport for a proportion of sick and wounded. In addition

to this Corps Transport, the General Transport of the Army provides for the conveyance of forage, food, and fuel to and from the great depôts, where the Corps waggons are loaded for the conveyance of the sick and wounded on extraordinary occasions, and for the grand depôts of ammunition. The transport allotted to each department of the *Corps d'armée* from the Train is under the orders of its own Officers. The ammunition columns under Artillery Officers, the supplies under the Commissariat, the pontoons and bridges under the Engineers.

The entire Train is under the orders of the Intendant General, who is responsible for the efficiency of the whole.

These Prussian regulations are, however, but in keeping with their military system. With them each *Corps d'armée* is localized and affiliated with the Landwehr and Landsturm of that province, in which its head-quarters in time of peace will always be fixed, and from which province alone its entire reinforcements in men and animals will invariably be drawn in time of war. The theory of this arrangement appears to be unexceptionable, and would possibly work well in a campaign when troops are in movement, or when fighting is going on; but if any body of troops, so supplied with transport, should be detached from the main army in the field, and remain stationary in one spot, it is clear that a great portion of their train must remain inactive, and its services be then lost, useless as it is alike to this body of troops and to the main army, who might be longing for their assistance.

The description of transport to be used in a campaign must depend upon the natural features of the scene of operations—"*Chaque pays, chaque mode*," would be the principle that must determine the agency to be employed. Mules and elephants, boats and waggons, men and bullocks, carts and camels, are all equally useful and indispensable according to the exigencies of the situation. But it is of wheeled and pack transport alone that I now speak, as they alone can enter into consideration, when the subject of "regular transport" is entertained.

The demands upon the Transport Corps, as "the carriers of an army," include—

1. Conveyance of ammunition.
2. Conveyance of the sick and wounded and hospital stores.
3. Conveyance of all army equipment, stores, and supplies, as well as the more special services of Engineer, pontoon, bakery, and telegraph trains.

For these duties, carriages on two and four wheels, as well as pack-animals, will be required.

The waggons must be of two descriptions, for special and general duties.

The former of peculiar construction, adapted to the requirements of the special service for which they are needed; the latter of such shape or build as may enable them to carry the largest amount of general or miscellaneous stores, without danger to the load, or injury to the horses, and to be applicable to a variety of uses.

To ensure efficiency and durability, all carriages should be constructed of the best and most suitable material, after the most approved

pattern, so as to combine lightness and strength, capacity and ease of draught.

Heretofore an inferior description of animal has been purchased for train purposes; but as waggons follow in the line of march on roads that have been cut up by Artillery and other troops, it is indispensable that the Train should be as well horsed as any other arm of the Service.

To the wheels especial attention must be paid. Wooden wheels with metal naves, of wrought-iron or gun-metal, should alone be used, until it shall have been ascertained that iron wheels can be constructed suitable for the service, as it is expected will prove the case.

The Equi-rotal system which presents undeniable advantages from the facility of exchange and unity of pattern, does not meet with that approval in this country, which I understand, at one time, they were disposed to accord to it in France.

The axle-arms should be made of one uniform size and pattern, so that the wheels might be interchangeable with those supplied to Field-Artillery.

All army carriages, with a few exceptions, should be fitted with springs, upon the triple grounds of increased facility of draught, protection to the load, and diminution of serious consequences to the carriage from the effects of concussion.

The four-wheeled carriages, to be drawn by four horses, should be of sufficient size and strength to carry 40 cwt.; although on active service a load of 30 cwt. should be the maximum that it would be advisable to place upon them. In European countries where good roads are general, great economy in animal power for transport service would be secured if four-wheeled army carriages were constructed so as to admit of three horses being worked abreast. It is calculated that by this arrangement, not only would fewer horses by one-fourth be required, but the entire length of train would be diminished by one-third, and a proportionate reduction in the numbers of the escort could be effected.

The carts for two horses should be fitted with axle-arms of the same pattern as those on the four-wheeled carriage, and should be equal to a load of 20 cwt. The maximum weight in field-service should not, however, exceed 15 cwt.

Poles should be used, and the waggons and carts should invariably be driven. The Prussians and Russians adopt this practice. The weight of the rider is distressing to the horse, and decreases his efficiency. A broken pole is easily repaired, as a spare one can be conveyed without difficulty. The drivers should assist in placing the loads on the waggons, and in removing them, and should be able to repair accidents.

The harness should be of the simplest pattern, but be composed of the best materials and of equal strength to that issued to the Artillery.

Upon good roads a carriage drawn by two animals will convey nearly three times the quantity that two pack animals can carry. To this increase of power must be added the economy in forage, which will be ensured by a diminution in the number of pack-animals.

A proportion of pack-transport must, however, always be maintained for service in any country where we may take the field, as such transport can easily be thrown on shore with troops, ready for immediate work, as was exemplified in our landing at Pehtang, in China.

It has been urged that where artillery can travel, wheeled transport can follow, and that consequently pack-animals should be dispensed with as being both inconvenient and expensive. But with this opinion I do not concur. Artillery covers the advance of troops, but does not always accompany them, and frequently is at considerable distance from the infantry who may be seriously engaged in ground whither wheeled-transport and artillery could not follow them. Pack-animals alone should be employed with troops when engaged, or when in front of the enemy, for the conveyance of regimental and reserve ammunition. Marshal Bugeaud condemned the employment of wheeled-transport except with the reserves. A defile or causeway may easily be blocked, and the advance of cavalry or artillery be delayed through the accident of a disabled carriage. Pack-animals create no such obstruction; they can accompany troops into the most broken or hilly ground—go under fire, and move upon the worst and narrowest roads, or across enclosures. They can always be at hand to bring up ammunition or to remove the wounded; and if a retreat becomes advisable, they can be dispersed over the country, and can retire over any ground upon any point, while the wheeled-transport is compelled to keep the roads, and incur the chance of being captured.

The disaster at Hohenlinden may be adduced as an instance of the inextricable confusion into which an army can be thrown, when their baggage-train may be compelled to retire upon narrow roads, which become hopelessly blocked in its endeavours to escape; and it has been said that the abandoned and broken-down baggage-waggons which encumbered the road between Brussels and Waterloo would, in the event of a reverse, have rendered our retreat almost impossible.

The pack-transport organized by the Duke of Wellington within the lines of Torres Vedras, furnished the only means by which he could have successfully pursued Massena over a country so exhausted in its resources as that which was abandoned by the French troops, while the Transport that accompanied the Austrians in 1866, when on the march, during their operations in the Tyrol, was entirely composed of pack-animals.

Selected animals should be detailed for the conveyance of ammunition and the ambulance stores. To each pack-animal a man should be detailed, when their services are required with the advance of an army. With those in the rear, two men to three animals, will be a correct estimate.

No pack-animal should be required to carry on inferior roads more than 160 lbs. of load, added to the weight of his saddle, some 43 lbs. It must be remembered that when troops halt, or receive a check, pack-animals can seldom be unloaded, and therefore do not experience that relief which is extended to animals in draught. It is questionable whether a pack-animal remaining stationary with its load upon its

back does not suffer and undergo more fatigue during the halt, than if it were marching at an ordinary pace.

For convenience of carriage, all packages intended to be conveyed on packs should be made up in an oblong shape, and should not exceed 80 lbs. in gross weight. The use of barrels should be confined to the conveyance of liquids. Their shape presents great difficulties of carriage, and if opened, they are not again closed without extreme trouble. For this reason ammunition should invariably be packed in boxes, or in strong cases of wicker-work, covered with leather or stout canvas.

The Otago pattern pack-saddle has been pronounced by all competent judges to be superior to all other descriptions of saddle, both as to the facility with which it can be laden, and to the comfort with which it can be carried. Instances of sore-backs were unknown among the 400 pack-horses of the Transport Corps in New Zealand, and among the animals of the mountain-battery in Abyssinia. And as this saddle possesses the additional merit of being adapted for riding, it is not surprising that after such experimental trials, it should have been pronounced the best for any service.

The subject of hospital-carriages has been so ably and so exhaustively handled by Professor Longmore in his treatise upon Ambulances, that it would be presumptuous on my part to express an opinion upon the principle which should direct the construction and management of such conveyances. In the cause of humanity we must hail with the liveliest satisfaction the anxious care with which this subject has been considered by all nations; for to no better purpose could science have devoted her energies than to the discovery of the means by which the sufferings of the sick and wounded could most effectually be alleviated.

I will but observe that while the dhoolie and the stretcher (wheeled or portable) afford the best and easiest mode for conveyance of the wounded to the field-hospitals, I am convinced that the cacolet is the most uncomfortable and most difficult to manage. Cacolets must, of course, be employed with cavalry, as no option would otherwise be left than to abandon the wounded to the mercy and charity of the enemy.

I approach with diffidence the question of the principles which should direct the constitution of the new Transport Corps, but I would suggest that the men should be selected from volunteers from our regular forces, and from such civilians as may have been accustomed to the care of horses and to the use of carts and waggons. The Officers should be drawn from those that are best qualified of the existing train, and from such Officers of the Army as may be deemed eligible for the service. Hereafter all vacancies should be filled by the promotion of the most deserving Non-commissioned Officers of the Transport Corps. While the principle of purchase should not be admitted in this Corps, the pay should be higher than the present rate. As the Transport will now form a branch of the Administrative Services, it is evident that the pay of the soldiers of the Train must be assimilated to that of the other branches. In time of war, the duties of the train are exceptionally

severe and arduous. In peace alone, can the Train be instructed in their duties, and if the labourer is to be worthy of his hire, the remuneration must be equivalent to the services we exact. No corps in our service should be more highly disciplined than the Transport, but drill must not be mistaken for discipline. Parade must not be confounded with preparatory training. The brightness of a buckle does not constitute efficiency, and in the smartness of appearance, real serviceable qualities may be overlooked. Rigid discipline must be enforced, but need not degenerate into the mere formalities of the drill serjeant.

The dress of men destined to act as waggoners and carriers for the Army should be loose, and free from all unnecessary encumbrances and accoutrements. While it should be soldierlike and neat, it must be appropriate to the duties of the Train; it must not embarrass the movements of the wearers, and must afford protection in the roughest weather. It would be better that, in time of peace, the soldiers of the Transport Corps should not be armed when employed on Transport duties. In time of war, a revolver would suffice for their defence, and could be carried in a waist-belt.

A small Park of Construction should, I think, form a branch of the Army Transport Corps. In this establishment, pattern carriages for transport purposes, could be built, and experiments be conducted. The wheelers, smiths, and collar-makers would be there instructed in their duties, and the material of the Train be inspected and repaired. The larger portion of the carriages that would be required for the service could be procured more economically from the trade, as necessity might dictate; but the models upon which the same should be constructed would be made under the superintendence of the Director of the Park, and a small staff of skilled assistants. It would be advisable that every Officer of the Transport Corps should undergo a course of instruction at this Park, from which he should not be relieved until he had become thoroughly conversant with the principles on which Army carriages should be constructed.

Lord Strathnairn's Committee has remarked that "the introduction of railway conveyance need not complicate the question of ordinary Military Transport." Railways may afford great facilities, but cannot enable any army to dispense with animal transport. Communication by rail may easily be intercepted, and no army could rely implicitly upon such means of conveyance in face of an energetic and unbeaten enemy. The memorandum by Lord Strathnairn upon this subject is conclusive as to the limited assistance that any General would derive from such a source. Invaluable at times, a railway might at other moments prove inoperative for good. Compelled by the movements of the enemy to abandon the line of rail, he must have recourse to animal transport, which may not be forthcoming to relieve him from his difficulties, if he were not fore-armed for the emergency. The General who may find himself in undisputed possession of a railway will undoubtedly enjoy great facilities in concentrating troops upon any point that he may select. But it is far easier to collect together by such agency an overwhelming force, than it is to feed it when so collected. Men are moved more easily than their supplies or stores. In 1866,

when the Prussians advanced into Bohemia after the battle of Königgratz, they were compelled, from this very reason, to extend their front, and to disperse their troops over a line of some 60 miles.

It is necessary that a certain proportion of Officers and men in our Army should be instructed in the management of railway engines and material? A train might fall into our hands in time of war, and our soldiers, but too probably, would not be able to profit by the opportunity presented to them. The knack of fixing rails and laying points would be a valuable addition to our military instruction; and sufficient knowledge in the mere rudimentary portions of the engineer and plate-layer's duties, might prove of invaluable service in time of war.

In conclusion, I beg to offer to you my sincere thanks for the patience with which you have received and listened to my remarks. The subject of my lecture is too comprehensive for the limited time at my disposal. I have not ventured to weary you with figures and calculations as to the collection and distribution of the Transport that would be required for such armies as now take the field, but have endeavoured to present the subject to your notice under a more attractive form, whereby I might enlist your interests, and deprecate your disapprobation of my efforts.

LECTURE.

Friday, May 7th, 1869.

LIEUT.-GENERAL SABINE, R.A., D.C.L., President of the Royal Society, in the Chair.

STORMS IN THE BRITISH ISLANDS, AND TELEGRAPHIC WEATHER INTELLIGENCE.

By ROBERT H. SCOTT, Esq., Director of the Meteorological Office.

WE all know that these islands enjoy a climate which is very equable, and is far warmer than that which would be due to their geographical position in latitude. The causes of this circumstance are very various, but they do not form any portion of the subject of the present lecture. Among the effects of it we may count our great liability to storms, especially in the winter time. Even over the area of these islands, limited though that be, there are marked differences in respect to this particular between the east coasts of England and the Atlantic shores of Ireland and Scotland, where it is only in sheltered situations that trees will grow at all.

We are placed on a sort of debateable land, between a cold and a warm area, during the winter time. In January the iso-thermal of 32° runs nearly due north from Strasbourg, until it reaches the Arctic Circle, so that if we travel due eastwards from England the temperature we experience will fall much more rapidly than if we changed our position in a northerly direction. There may be said to be a constant tendency to atmospherical disturbance, resulting in storms, wherever great differences of temperature are observed in adjacent districts, whether these differences in the temperature of the air exist over land, or over the surface of the ocean.

The former condition is what is associated with many of our own winter storms. A difference of 20° is not unfrequently noticeable between the temperatures taken simultaneously at Valencia and Yarmouth; and as much as 30° has been observed between the thermometer readings made at the same hour in the east and west of France shortly before a serious storm has commenced.

The latter condition, that of differences of air-temperature over the

sea, is what is associated with the dangerous storms met with off the south coast of Africa. The Royal Meteorological Institute of Holland has published several investigations bearing on this subject, and from these it appears that in rounding the Cape from the westward the chance of falling in with a storm increases to a maximum about the meridian of 20° E., and diminishes after that district is passed. This region is precisely that where the remarkable changes in sea-surface-temperature are observed. These changes arise from the meeting of the warm current from the Indian Ocean coming down the Mozambique Channel, with the cold south Polar current. A change of 19°·5 in the temperature of the sea has been observed within one hour in this locality.

It is not, however, with the theoretical origin of our storms that I have to deal to-day, so much as with their history once they have commenced, and with the means we possess of giving news of their approach to our shipping, and thus, to some extent, of averting the damage they might otherwise cause.

The first idea of giving intelligence of advancing storms is undoubtedly traceable to the fact that some of the most serious storms felt anywhere, the West India hurricanes, travel along definite tracks. When a hurricane is first observed, it is usually at one of the windward islands, such as St. Thomas, or Antigua. It then visits successively St. Domingo, the Bahamas, and the coast of the United States, and ultimately passes out to sea again after describing a rudely parabolic course. As soon as it is known that such a storm has reached the coast of America, where alone efficient telegraphic communication exists along its track, news can be sent in advance of it, and thus captains in distant ports can be warned to prepare for its coming.

Most of the storms which are felt in these islands come on us from the Atlantic, so that it is quite impossible for us to get intelligence that a storm has actually begun anywhere before it reaches our own coasts. Accordingly we are compelled to look for other signs, and in most cases, fortunately, there are such indications. To interpret these aright, is the task to which we must address ourselves.

The history of the system of storm-warnings, as carried out in this country, is briefly this. When the Meteorological Department of the Board of Trade was established in 1855 by Mr. Cardwell, Admiral FitzRoy, then a Captain, was appointed as its chief. He had all his life paid special attention to the study of weather, and accordingly when means were placed at his disposal for the study of the meteorology of the entire ocean, the object for which the office was originally established, and which still continues to form its most important sphere of action, he soon began to turn his attention to the investigation of the weather of our own coasts. This subject eventually attracted his own attention almost to the exclusion of anything else.

At the meeting of the British Association, held at Aberdeen in 1859, under the presidency of the late Prince Consort, the idea was started that the telegraphic system might be used for the purpose of collecting and transmitting intelligence of storms. This proposal was taken up warmly, and a Committee was appointed to organize a practicable

system of operations. The loss of the "Royal Charter" off the coast of Anglesey on the 26th of October in that year, immediately after the Aberdeen meeting, added fuel to the flame. A very careful investigation was made in the office into all the circumstances of that storm, and the results were published as No. X of Meteorological Papers issued by the Board of Trade.

The British-Association-Committee met on several occasions, and ultimately they adopted certain resolutions, which, however, were very cautiously worded, and confined to the recommendation that a plan should be tried for the communication from one place to another of the *fact* of the existence of a storm.

About the same time, M. Le Verrier, the Director of the Observatoire Impérial in Paris wrote to the Astronomer Royal here, suggesting a scheme for international co-operation in the work. In this letter he said that the final result at which he aimed was to give notice of a storm as soon as it appeared on the coasts, and to transmit intelligence of it to the ports which it might visit.

You will see that no idea of prophecy was originally propounded.

Admiral FitzRoy was not content with this system, and he proceeded to substitute for it a plan of foretelling, or, as he called it, "forecasting," firstly, storms for three days in advance, and subsequently, weather for two days in advance.

In order to collect the information, he made arrangements with the Telegraph Companies to have observations made by certain of their clerks at stations distributed over these islands. Instruments were supplied to them for the purpose, and a reporting code, in cypher, was devised, which has scarcely required any modification since it was first proposed.

Admiral FitzRoy's warnings, as I have said, conveyed a distinct intimation that a gale from a definite point would probably blow within three days at the place where the signal was hoisted. The signals used by him were, as is well known, the drum and cone.

If the cone was hoisted in an erect position it indicated northerly winds; in an inverted position, southerly winds.

The drum indicated that the wind which would blow, would be likely to change its direction suddenly.

The system of storm warnings was commenced in February, 1861. The first forecasts of weather appeared in August of the same year. These latter were only published in the daily newspapers, and were not made known by means of signals.

Although some scientific authorities entertained serious doubts as to the utility of the system practised by the office, it went on without hindrance until after Admiral FitzRoy's death in April, 1865. Subsequent to this date, a Committee was appointed, at the request of the Board of Trade, by that Board, the Admiralty and the Royal Society, to enquire into the condition and working of the office, and this Committee reported strongly against the system as actually carried on. Finally the Royal Society, when requested by the Government to appoint a Committee to take the superintendence of the office, declined to undertake the issue of storm warnings, so that when, at the end of 1866,

the office was handed over by the Board of Trade to that Committee, the warnings were suspended.

Soon after the circular suspending the warnings had been issued, memorials praying for their restitution were forwarded from several ports, and the question was repeatedly brought before Parliament. Ultimately, at the end of May, 1867, the Committee were requested by the Board of Trade to give some intelligence of storms, in such manner as they might think fit. This the Committee at once undertook to do, as soon as they should have completed the inspection of their stations, but stated that they would confine the intelligence sent to a communication that a storm or a serious atmospherical disturbance *existed* on some part of our coasts.

You will notice that the Committee thus expressed their readiness to give some information regarding storms, three months before the meeting of the British Association at Dundee, at which meeting very strong resolutions praying for the restitution of the Fitzroy system were adopted.

The present system was commenced in January, 1868, and I shall now proceed to describe it.

The stations from which reports are received are 42 in number, 18 of these are British, 13 on the Continent of Europe, and 1 is at Heart's Content, in Newfoundland.

The only serious change which has been made in the home stations of late, has been the substitution of Pembroke for Weymouth, in order to get additional information from the coast of the Irish Sea. Possibly some of the existing stations might with advantage be suppressed, in order to enable the office to establish stations on the north-west coasts of Ireland and Scotland, but as yet no steps have been taken to effect this change.

The foreign stations have all been organized by means of the co-operation of the French authorities, which is most freely given. Both M. Le Verrier, representing the Observatoire Impérial, and Captain Véron, on behalf of the Ministére de la Marine, have been most ready to do all that they can to render the service effective. The system of international telegraphy is carried on by means of an exchange of telegrams, and it is only just to the French to say that they interpret the terms of this exchange most liberally.

Our own stations are fairly well placed as regards their geographical position, but less so in respect to their local situation, as to their being sheltered by hills, &c. Thus, for instance, Greencastle, at the mouth of Lough Foyle, scarcely feels any of our gales, at least with their full force.

The only great scheme of improvement which has been proposed has been a very wild idea, viz.: to anchor vessels outside our coast, connected with the shore by telegraphic wires. This plan was seriously proposed by an eminent foreign Meteorologist, who is, however, it is almost needless to say, a landsman. We may very fairly wait, before we adopt it, until he has taught us how to moor a vessel in 1,000 fathom water.

The first thing to be done before the Committee could issue warnings

was to inspect the stations, a duty which had never previously been undertaken. This was effected in 1867, and the least that can be said of it is, that it was most urgently needed.

The telegraphic clerks, many of them with the greatest desire to observe and report well, had never had any instruction in the way of placing their instruments correctly. The thermometer readings were in many instances absolutely useless, the instruments having been set up under the roofs of railway stations. In one place the wet bulb was found immersed in water. At the very next station, no water had been near it for three weeks, except when it rained, and by both reporters, readings purporting to be of dry and wet bulbs, were regularly sent up. One man did not know the points of the compass. In fact it would have been a simple impossibility for anyone to have drawn correct conclusions as to weather from the materials for the purpose which were at Admiral FitzRoy's disposal. No one but he could have done so much as he did with the chances so much against him.

The first inspection produced a very beneficial effect, and since the second was carried out last year, a great improvement has been noticeable in the reports.

The information received from these stations consists of observations taken at 8 a.m. daily, and in addition, barometrical readings taken at 6 p.m. on the previous evening, with a report of the prevalent weather and of the strongest wind experienced during the preceding 24 hours. By this means we attempt to get an idea of what passes during the day at the different stations. What we do get, is not very satisfactory, but it is better than nothing. However, some few of the most important stations send afternoon reports.

This system, after all, gives us very little information as to what really takes place, as you will see presently.

Between the hour at which messages must be sent off, so as to reach London before the office closes and the next morning, serious changes may occur. The giving notice of these, especially during night time, would involve considerable extra expense in payment to the reporters and to the clerks in the central office.

The supply of Sunday reports, the want of which causes a serious weekly break in our system of weather-study, could not be effected without the continuous attendance throughout that day of all the observers at their posts, and of a staff in London to discuss their reports. You cannot fix the hour at which weather-changes are to take place, and must, therefore, be always on the watch. If then intelligence received from the stations is to be afterwards communicated to the ports,—and unless this be done there is no use in collecting it,—we must have the telegraphists at the out-ports also in attendance during Sunday.

Before we leave the subject of collecting information, there is one point which deserves notice. It is this—that errors in telegraphy and discrepancies between the reports sent in, cause us most serious inconvenience, involving as they do frequent repetitions of the telegrams and subsequent correspondence, if the repetition fails to remove the

doubt. In order to counteract the ill effects of this liability to error, check stations have been established, *e.g.*, the three on the south coast of Ireland, so that we are nearly sure to get a true account of any serious change which sets in there. Reports from isolated stations, such as Heart's Content, Corunna, and Skudesnaes, are comparatively of minor value, as we cannot place implicit reliance on them owing to our inability to check them.

Accordingly, you see that we are in a considerable difficulty about obtaining the materials on which our study of weather and issue of intelligence is to be based. Suggestions for the maintenance of a constant day and night watch on the west coast of Ireland, or for the receipt of reports from Archangel or Odessa, are simply impracticable, principally on the ground of expense.

Having thus discussed the collection of information respecting weather, we have next to treat of its distribution to the public. The signal adopted by the Committee, is the drum formerly used under Admiral FitzRoy's system, and it is hoisted at 100 stations on our coasts. The intelligence supplied, is simply an intimation that there is an atmospherical disturbance somewhere on the coast, but it does not convey any expression of opinion that that disturbance will result in a storm at the spot where the drum is hoisted. The message is in each case sent to such places as seem to the office likely to derive benefit from it, but the recipients of the news are left to draw their own conclusions as to whether a storm will probably reach them or not. The office, however, aids them in forming opinions as to weather by means of circulars and the Fishery Barometer Manual, which are liberally distributed, and also by the free loan to small ports, of fishery barometers, an assistance most readily afforded both by the Meteorological Office and the Royal National Lifeboat Institution.

The task thrown on sailors is not a very difficult one, as all these men are already well accustomed to form a judgment as to probable weather from their own unaided observations. The hoisting of the drum simply indicates to them that there is danger about, and that there is additional reason to be cautious.

The drum remains up for 36 hours at a time. This limitation does not mean that a storm will come on within that interval, but simply that within 36 hours the weather will probably have declared itself.

Every message ordering the drum to be hoisted, conveys the reason of that order being given. The message itself should be, and frequently is, posted up on the flagstaff where the drum is hoisted. In addition, the harbour authorities can, if they wish, obtain information as to previously existing weather from the daily weather report, a copy of which is supplied free of cost by post to any port which asks for it.

It is necessary, under the present system, that the facts of the disturbance should be made known to the people at the port. As, however, it would not be possible for every one to go to the flagstaff and read the telegram, Captain Toynbee, my colleague, has invented the semaphore, of which a model is exhibited. This shows at a glance the direction and force of the wind which is blowing, and also the locality

where it is blowing. The apparatus has been on trial for about a year at Blackwall, by permission of the Trinity House; at Liverpool, by permission of the Mersey Dock Board and the Royal Mersey Yacht Club, and at North Shields by permission of the Corporation of that town. No definite conclusion as to its use has as yet been arrived at.

We now come to the practical utility of the present system. Admiral FitzRoy believed in the general transference of the whole body of the atmosphere from west to east, and although this is not strictly true, it is true that most of our storms make their first appearance in the west and travel to the east. We get our first intelligence from our own west coasts, and so we cannot often give news of the disturbance to that district before the wind reaches the force of a gale. These are, however, coasts where there is not much shipping. Intelligence can be given with much greater effect to the Irish and English Channels and to our own North Sea Coast. To take an instance by way of illustration:—A very severe northerly storm set in at Valencia at 7 a.m. on the 19th of March last. As soon as the news reached us, we telegraphed to Holyhead and Pembroke to send extra reports at once. The clerk at Pembroke replied at 1 o'clock, that the weather was then improving, but at 2.30 he telegraphed again to say that the gale was just beginning. It swept over the channel and the north of France during the night. In this case, then, we are able to determine exactly the rate at which the storm was travelling. As a proof of the general easterly motion of our storms, I may quote the account given by Herr von Freeden, of the Norddeutsche Seewarte in Hamburg, of the results of the telegraphic warning system which is carried on between that office and our own. Thirty-seven messages of actual gales were sent to Hamburg during the year 1868; 19 were followed by a gale, 9 by a strong wind, 6 by no change of weather, and, in three instances only, did the storm, and that an easterly one, exist before the warning reached the port. Professor Mohn, of the Meteorological Institute of Norway, has been receiving similar messages from London during the past winter, and although the direct cable to Norway is not yet laid down, and the messages are delayed seriously *en route*, he says, in a letter just received, "I cannot but say that I am very well satisfied "with the results obtained."

In order to give satisfactory warning of storms, we must know three things about them:—

I. The signs of their approach given by the instruments and by natural phenomena.

II. The direction of their advance.

III. The rate of their motion.

If any one of these important data are wanting, we are utterly at fault; and, as we must necessarily wait for some time before either of the two last-named elements can possibly be determined, it is obvious that unless we get a deeper insight into the general motions of the atmosphere than telegraphic reports from one district can give us, we shall not be able to do much in the way of judging of weather beforehand.

I have told you that most of our gales come on us from the west-

ward. They do not all do so. That of Easter-day last, first showed itself on the day before, on the coast of Norway. Next morning at 8 a.m. it was blowing hard from N.E. at Scarborough. This wind travelled down the coast during the day, and at 4 a.m. on the Monday morning, H.M.S. "Ferret" was wrecked at Dover. This storm, therefore, did not come in from the west.

Again, if a storm is advancing very rapidly, it may come on us before we expect it. This was the case with the storm of August 22, 1868, of which I exhibit a diagram. On the afternoon of the 21st, at 2 p.m. there were no signs of its approach, and yet, at 8 a.m. next morning, a furious north gale was raging in the south of Ireland. News was sent to Liverpool at noon, some five or six hours before the storm actually reached the Mersey; but several vessels which went out during the day were caught and wrecked. Another instance of a gale travelling very quickly was that of February 12, 1869, of which I exhibit the records from the observatories. This storm did not pass over Valencia; it advanced on us from the W.S.W., was first felt at Penzance and Brest and moved up the Channel at a very great speed. It did a great deal of damage. At present we know of no certain principle by means of which such gales as these might have been foreseen. They must necessarily, as far as we know, have thrown astray any calculations or forecasts made for three or even two days in advance.

Having thus told you some of the difficulties which beset the study of weather, I shall now proceed to show you some of the scientific principles, by the help of which we hope to grapple with and overcome them.

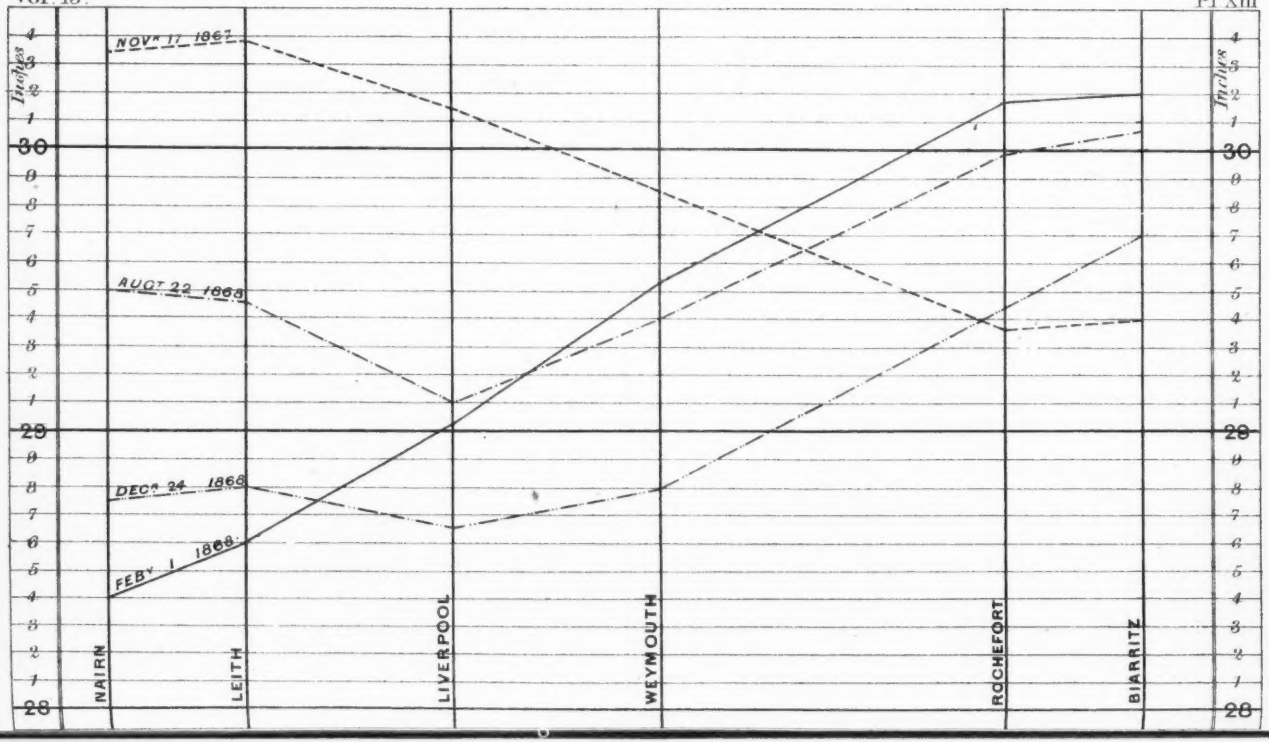
The former rules for the prediction of weather all depended on observations taken at a single station, without any reference to what the atmospherical conditions prevalent close by, might be. The old idea about barometrical indications was clearly shown by the words, "fair," "change," "storm," &c., which appeared on the scale of the instrument. These have long been known to be useless, and for them others have been substituted, which in their best form are those devised by Admiral FitzRoy, and placed on the fishery barometer-scales. The principles on which these rules are based are not, however, thoroughly satisfactory, as it is found that the knowledge of simultaneous observations taken at several stations is requisite to the drawing of right conclusions as to probable weather.

Among the most important steps made in the direction of satisfactory weather-study, has been the establishment of a law for the motion of the wind as referred to the readings of the barometer. This has been done by Professor Buys Ballot of Utrecht, but the principle of the law was established long ago by Redfield, and by Dr. Lloyd, the present Provost of Trinity College, Dublin.

The law is as follows:—

Stand with your back to the wind, and the barometer will be lower on your left-hand side than on your right.

Stated thus, the law has no predictive force, but, if it be stated conversely, it will bear such a meaning. On this law the weather in-


Inches
NOVR 17 1867
AUGT 22 1868
DECR 24 1868
FEBY 1 1868
NAIRN
LEITH
LIVERPOOL
WEYMOUTH
ROCHEFORT
BIARRITZ
30
29
28

telligence, which is issued in Holland, is based. An apparatus termed an aeroclinoscope, is used. This consists of a yard slung on a mast, and arranged so that it can be sloped at any definite angle, so as to correspond to any barometrical difference of reading observed in Holland on any day. The whole apparatus is moveable round a vertical axis, so that it can be placed in any azimuth to correspond with the direction in which the difference is observed. If then you face the instrument, and have the end which is lowest on your left hand side, you will have your back to the wind which will blow during the day. There are some difficulties in the way of using this instrument, and it has not been adopted here. However, the principle upon which it is based, is used extensively in our present system of weather telegraphy.

The first step taken when the Committee directed the study of weather to be commenced, was the drawing of daily maps. As soon as a sufficient number of these maps had accumulated, viz., for nine months, a regular examination of them was instituted, with the view of testing this law.* The first thing done was to determine the daily difference between simultaneous barometrical readings over a definite area, and compare with this difference the winds subsequently experienced. The limits taken were Nairn, Vaiencia, Rochefort, and Helder, forming a quadrilateral, of which the diagonals are about 600 miles in length. As a result we find that whenever the difference of barometrical readings exceeds 0.6 in. over this area, the chance is 7 to 3 that the wind will, before next morning, reach force 8 of the Beaufort-scale, at three stations within the area (this is what we call a storm), and that its direction will have been indicated correctly by the law.

On the other hand, the chance is 9 to 1 against any storm coming on which has not given signs of its approach by atmospherical disturbance, detected by barometrical readings at least some hours before.

The principle has proved a most useful one, as it is so eminently practical. We know from it, with very considerable certainty, what winds are likely to blow during the day, and, therefore, what is the danger most to be apprehended. It does *not* tell us how soon the storm will come, but it does tell us that if the readings in France are much higher than those in Scotland, there is no danger of an easterly gale.

The conditions of pressure which have been noticed on the occasions of several remarkable gales are represented on Plate xiii.

The horizontal scale is approximatively proportionate to the distance between the stations, the distance from Nairn to Leith being about 100 miles.

The actual barometrical readings, and the winds, with their force (Beaufort-Scale), observed in each case are as follows :—

* The results of this enquiry have been printed by permission of the Committee.

	November 17, 1867.		February 1, 1868.	
	Barometer	Wind.	Barometer.	Wind.
Nairn	30.33	W.N.W.$_{1}$	28.40	N.W.$_{3}$
Leith	30.38	N.E.$_{3}$	28.58	S.W.$_{7}$
Liverpool	30.14	E.N.E.$_{8}$ (Holyhead)	29.03	W.$_{8}$
Weymouth	29.84	N.E.$_{9}$	29.52	S.W.$_{8}$
Rochefort	29.37	N.W.$_{2}$	30.16	S.W.$_{5}$
Biarritz	29.41	S.E.$_{1}$	30.20	S.E.$_{1}$
	August 22, 1868.		December 24, 1868.	
	Barometer.	Wind.	Barometer.	Wind.
Nairn	29.50	E.N.E.$_{1}$	28.75	S.S.W.$_{1}$
Leith	29.46	S.S.E.$_{4}$	28.79	S.E.$_{1}$
Liverpool	29.10	S.S.E.$_{8}$ (Holyhead)	28.65	S.E.$_{2}$
Weymouth	29.42	S.W.$_{9}$	28.81	W.N.W.$_{5}$
Rochefort	29.96	W$_{5}$	29.44	W.S.W.$_{9}$
Biarritz	30.07	N.W.$_{4}$	29.71	S.W.$_{9}$

It will thus be seen that the directions of the wind required by the law were strictly observed in each case. Its force will be seen to depend on the difference of readings between the stations. Thus, the gale on the 24th of December was not felt at any British station, although the barometrical readings at all our stations were below 29 inches. The only district in which the gale was observed was in France, where readings were much higher than they were here, thus producing a considerable barometrical difference.

As an instance of the use made of the principle, I may cite the system of telegraphy carried on with the Underwriters' Association of Liverpool. Whenever the difference of readings over the area already referred to exceeds 0·5 in., a special telegram is sent to the Underwriters' rooms. By this means the subscribers gain intelligence before the disturbance becomes serious. They continue to receive daily messages, until atmospherical equilibrium is again restored, and are thus kept informed of what is going on about them. The system of warning telegraphy carried on with Holland, Hamburg, and Norway is conducted on similar principles. A message is sent whenever there is a certain amount of disturbance of pressure, without reference to the fact of a gale having commenced or not.

This system, however, only tells us in general terms that there is a chance of a storm, but does not say exactly where it will blow hardest. In order to localize the indications, we proceeded to triangulate the area of our observations, as if we were surveying, and to calculate the daily barometrical differences along all the lines thus obtained. These barometrical differences were all reduced by means of factors to gradients per 100 miles, and it was found that, assuming a gradient of 0·12 in. as a sign of danger, the average chance, for all points of the compass, for a wind of force 8 to succeed such a gradient, was about 6 to 4. The south-west winds were more certain to follow the indica-

tions than the others. North-west winds were peculiarly liable to "back."

Now, with this principle well in our minds, let us proceed to see how it may be applied. The first sign of an approaching storm is usually a decrease of pressure in the west of Ireland. This produces a gradient sloping in a direction from E. to W., and indicating a southerly wind, which you all well know is the usual commencement of a storm. Now, if we find that pressure is falling fast at Valencia, and that at Greencastle and the Scotch stations it is following suit, while readings at Rochefort continue high, we feel sure that the wind will veer to W., and probably to N.W., in which latter case, pressure at Valencia will recover quickly. If, however, the fall at Valencia is followed by a rapid fall at Penzance, while northern stations remain unaffected, it is probable that we shall have north-easterly winds in the north of England, and on the east coast.

Before an east wind can blow, the pressure in France must be much less than in Great Britain. This condition may be produced either by a barometrical depression travelling across France, while our readings remain high (this motion is usually from the westward), or else by a local depression being actually formed in France, a case which sometimes seems to occur, but of which we know very little.

This law of Buys Ballot's throws some light on the probable motion of the air, once a disturbance has definitely formed itself; but it does not aid us in forming an opinion as to the changes which may be in progress outside the limits of the area covered by our observations, and thus to foresee what is coming on.

In order to do this, we must carefully examine the atmospherical conditions which have preceded most of our great storms, and see whether we are able to discover any similarity between them, which would in any way enable us to detect even a suspicion of a relation of cause and effect between these conditions, and the storms which followed.

The entry of the observations on daily charts was a great help to this study, as such graphical representations are easily compared with each other.

The first fact of interest which showed itself, was that in certain instances a similar succession of weather seemed to reappear. Thus two of the diagrams exhibited, form part of a series of ten days which recurred in December last, after having been noticed in the previous January. This is extremely interesting, though it is only what any one who has watched the weather carefully for any considerable time would be led to expect. In saying this, I must not be taken as asserting that there is any proved periodicity in these phases of weather. When a fact like this has to be established, its advocates have usually to strain a great many points. Thus recently it has been attempted to establish the periodicity of the Royal Charter gale at the end of October. In order to do this, every gale which has been registered in the month of October for many years past has been pressed into the service; thereby several that were merely equinoctial gales, and were therefore due a full month before the

period to which they were referred, have been quoted in confirmation of the theory.

Among the instances of recurrence which have been noticed, that already referred to, merits special attention, and I shall now proceed to describe it. On the 22nd of January, 1868, very remarkable atmospherical conditions appeared. There was a strong W. gale in France, with easterly winds over the north of England, a barometrical depression existed between the two currents, and a thick fog was felt in London. This was succeeded on the 23rd by a rapid rise in pressure with northerly winds, and before daylight on the 24th a tremendous southerly storm burst upon Scotland, and did immense damage. The same conditions as on January 22, re-appeared on the 8th December last, and were followed after the same interval by a similar southerly storm, though one not quite so serious as that which had occurred eleven months previously. This set us all to work in the office to examine all cases in which similar atmospherical conditions were noticeable, and several instances of these were discovered. These conditions are the co-existence of the two great currents of air, the Equatorial and Polar currents, at the earth's surface, the latter lying on the polar side of the former. This relation of the currents to each other has long been noticed by Mr. Meldrum, the Secretary of the Meteorological Society of the Mauritius, as preceding the commencement of the cyclones in the Indian Ocean. He says in a recent paper published in the Journal of the British Meteorological Society, that these cyclones *invariably* arise between two such currents when the barometer begins to fall.

Whenever we have noticed the existence of these remarkable conditions, a southerly gale, or at least a fresh southerly wind is nearly sure to occur within the area of these islands within about 48 hours. Out of 24 cases examined, 12 were followed by such gales after 48 hours, 4 by gales immediately, 7 by fresh southerly winds, and 1 was a failure. This is very satisfactory, as it may perhaps lead us to useful results hereafter.

In order to work out this or any other question in meteorology, we want abundance of materials in the way of observations, and those too of a very high character. I have already explained to you, that we really gain very little information as to weather from our telegraphic stations, as very few observations are made there in each day. The scheme of land-observations suggested some years ago by the Royal Society, and at present carried out by the Committee of the Meteorological Office is calculated to render good service in this respect. The original object for which this scheme was first promulgated, was the determination of the various meteorological elements for these islands in a way independent of eye observations, by means of continuously self-recording instruments. The instruments employed are a barograph and thermograph which register themselves by means of photography (these instruments have been brought to their present state of perfection mainly by the efforts of the staff of the Kew Observatory); and the well-known anemograph invented by Dr. Robinson, which records itself mechanically. Messrs. Beck, of Cornhill, have kindly

allowed me to exhibit a complete set of these instruments, and I shall be happy to explain their construction after the lecture to any one who may wish to see them.

The records, however, are quite continuous, and I exhibit a diagram showing a barometrical oscillation which passed over these islands within 24 hours, and also a curve showing a remarkable instability of pressure. You will at once see how perfectly impossible it would be to attempt to obtain a record of such phenomena from eye observations, such as those used for the Daily Weather Reports.

The stations at which these instruments are erected are 7 in number, and have been selected with reference to their geographical position. There are 3 of them in England; Kew, the central one, under my colleague, Dr. Balfour Stewart, who undertakes the entire supervision of all the observations; Falmouth; and Stonyhurst. Two are in Ireland, Armagh and Valencia, and two in Scotland, Glasgow and Aberdeen. Another station in the extreme north of Scotland is most urgently needed, but there are as yet no funds to support it.

As an illustration of what these observations can yield, I exhibit as I have before said, the curves from the storm of February 12, 1869.

There is, however, one serious difficulty which meets us when we discuss land-observations, however accurate they may be. This is that the wind does not blow *true*, as regards either force or direction, inland as compared with observations made at sea. The observatories on the coast, such as Valencia and Falmouth, register much more wind than those inland like Kew and Stonyhurst. As regards direction, the lie of the country, and even the distribution of the woods has a tendency to produce irregularities and eddies. This serious defect can only be eliminated by increasing the number of points of observation, and we hope that private observers will come forward and help to complete our scheme for investigating the meteorology of these kingdoms.

After all, it is mainly to the observers at sea that we must look for our records of wind, and especially to sailing ships. These islands are a mere speck on the surface of the globe, and the weather we experience is only the result of changes which affect immense areas. For information as to these changes we must look to the sea; the observations made on shore, accurate though they are, are affected by so many disturbing causes, that there is always a difficulty in dealing with them.

The Meteorological Office has been established mainly for the investigation of Marine Meteorology, and it is to Officers in the Navy and in the Merchant service that it must look for the most efficient aid in the collection of new materials. The Office is always prepared to lend instruments to gentlemen who will undertake to observe with them regularly, but the main object we have in view is the quality, not the quantity of the information contained in the register; observations carefully made and accurately recorded, are the first and most important requisite towards the investigation of the laws of our storms, and the issue of satisfactory telegraphic weather intelligence.

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